

CHAPTER IV NATURAL RESOURCES

A. INTRODUCTION

Natural resources and wild areas define the character of Lyndeborough to a greater degree than perhaps any other town in the Nashua region. Lyndeborough's extensive forested hillsides, wetlands, and agricultural areas form the ever-present background for the community's quality of life. Lyndeborough contains the highest elevation in the Nashua region (1,820 feet on the slope of North Pack Monadnock) and the greatest number of peaks over 1,000 feet (Winn Mountain, Pinnacle, and Rose Mountain). A greater percentage of Lyndeborough (87%) is forested than any other town in the region. Nearly 73% of this forested area is found in blocks greater than 500 acres. All of these natural characteristics are significant for wildlife habitat and biological diversity.

The Town of Lyndeborough lies on the western reaches of the Lower Merrimack River Basin in south central New Hampshire. The Town's rugged terrain and glacial till soils are indicative of the glacial activity which crept southeasterly across the area over ten thousand years ago. The northwestern portion of Lyndeborough contains the highest elevations in the Nashua Region. The rough terrain of this area includes steep slopes and shallow-to-bedrock soils, which make development difficult and costly. The southeastern section of the community is lower in elevation with a rolling terrain and shallower slopes. This area also contains the remaining agricultural land in Town.

In analyzing the Town's natural resources, it is important to understand that a unique set of natural resource constraints to development may exist on each individual parcel of land. This chapter is a guide to these natural resource constraints and considers: 1) topography; 2) slope; 3) soils; 3) water resources; 4) forests; 5) wildlife and plants; 6) existing conservation lands; 7) visual resources; 8) priorities for future conservation efforts; and concludes with a series of recommendations.

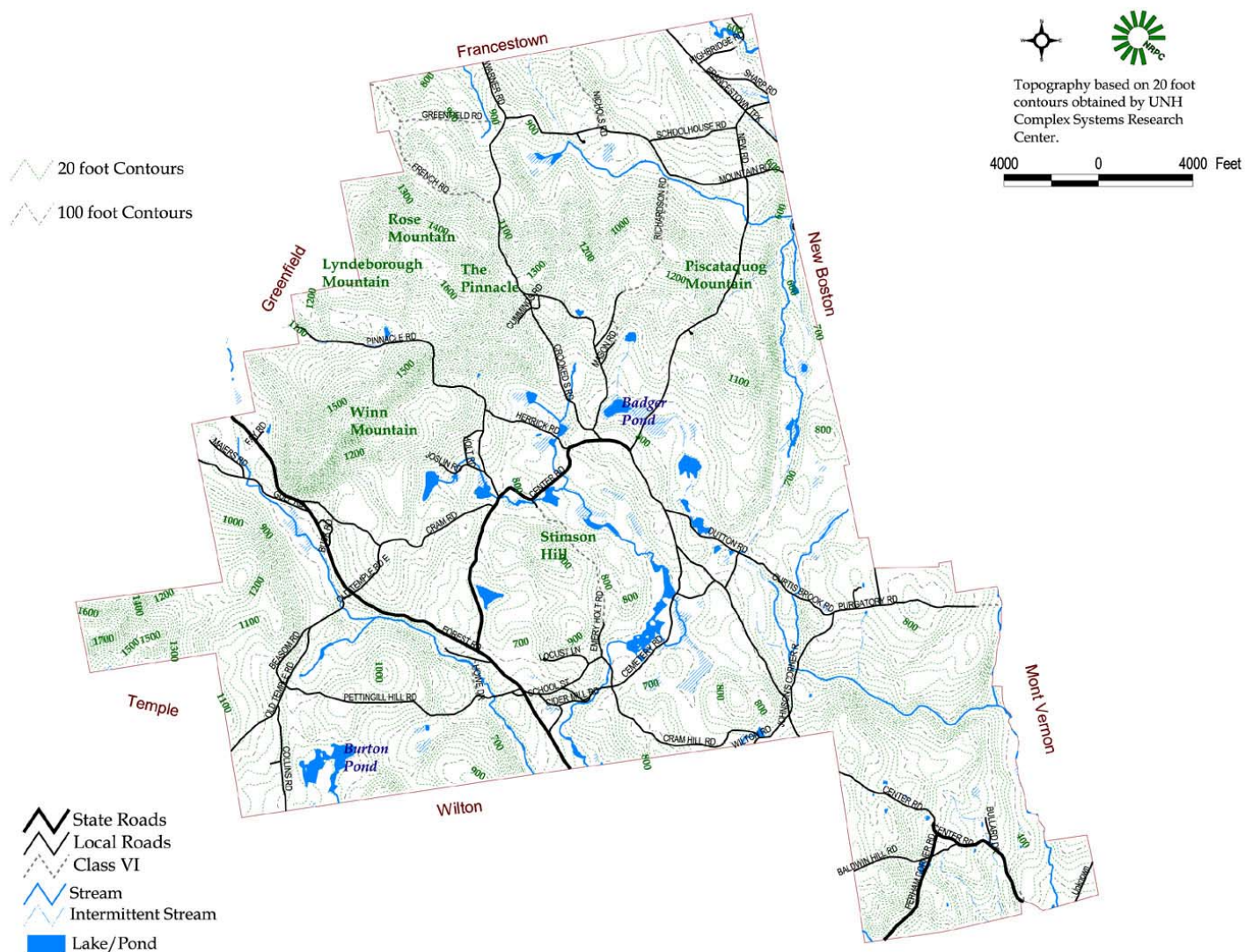
B. TOPOGRAPHY

By far, the most visible and interesting of Lyndeborough's natural resources is its topography. The high elevations and rugged terrain are unique in the Nashua Region. Topography generally relates to the surface configuration of the land. The topography of an area can be described by two measurable characteristics: Elevation and Slope. A brief description of each of these factors is given below, along with an explanation of their importance in planning for land use and development within the Town.

1. Elevation

Elevation defines the relative height of a piece of land at a given point. So that measures of elevation are comparable, they are expressed in terms of feet above Mean Sea Level (ft. AMSL). Elevations in Lyndeborough vary from 280 ft. AMSL in the southeasternmost corner of Town, to 1,820 ft. AMSL in the extreme west of Town, (a range of 1,500 feet). More than one-quarter of the land area in Town sits at elevations above 1000 feet. Among the highest points in Town are Winn Mountain (1,676 ft. AMSL), the Pinnacle (1,686 ft. AMSL) and Rose Mountain (1,725 ft. AMSL). The highest elevations in Town are portions of the North Pack Monadnock, whose peak lies just west of the Town's boundary. Overall, the higher elevations are located in the west and north-central sections of Town. As such, they present a significant barrier to free access and movement between the northern and southern portions of Town.

Map IV-1: Topography





Lyndeborough's high elevations (above 1000 ft.) are a unique local and regional resource and contain large wilderness and undeveloped areas. For example, the high elevations in west Lyndeborough are part of the largest undeveloped wilderness area located totally in Hillsborough County. This area includes the Wapack National Wildlife Refuge, Miller State Park and adjacent areas. They offer area residents the opportunity to

witness the rolling terrain of the western portion of the Nashua Region. The areas in the west of Town with elevations above 1,500 ft. are on the eastern reaches of the Monadnock range and offer a vantage point from which to view Pack Monadnock and North Pack Monadnock to the west, the sprawling Merrimack River Valley to the east, and Boston to the southeast. The wonderful views and vistas offered from these sites merit their conservation. The natural conditions of these areas may preclude their development for certain uses. It is recommended that the Town make an active effort to retain areas above 1,500 feet elevation as open space to provide access for the community to these areas and to establish sound forest management to maximize their open space/recreational value. In addition, development above 1,000 feet elevation should continue to be limited.

Lyndeborough currently implements elevation-based Zoning. Development located above 1500 feet is limited to one residential unit per a minimum 10 acres. Currently there are no subdivisions located above 1500 feet. Another way of increasing protection of these higher elevation areas would be to purchase conservation easements or the development rights to the lands involved. The method that offers the most protection assurance would be the outright fee simple purchase or acquisition of the land. Neither option is inexpensive, unless the owner happens to offer the easements, development rights or a "bargain sale." However, these are the options that offer the greatest level of protection and public use of this unique resource. Not only would conservation easements or fee simple purchases ensure that these mountaintops are preserved, but they could also allow the public to view the distant vistas described above. The higher elevations in Lyndeborough may not be considered of statewide importance but they have regional and local significance. For this reason, assistance and funds should be actively sought to protect and preserve these important resource areas.

2. Slope

Slope refers to the relative steepness or pitch of a piece of land. Measurements of slope are expressed in percentages and are calculated by dividing the difference in elevation of two points by the distance between the points (i.e., change in elevation/distance = % slope). Thus, land with 0% slope has constant elevation and is perfectly level. Likewise, land with 100% slope has a pitch equivalent to a 45-degree angle.

The slope of a piece of land affects its capability to support various land uses. The mapping of slopes can be a valuable tool in determining areas where slope conditions may require special design considerations or other precautionary measures. The following slope categories are recommended for consideration in planning for the future land uses in Lyndeborough. Where slopes are to be developed, those involved should consult the principles, methods and practices found in the Erosion and Sediment Control Design Handbook for Developing Areas of New Hampshire (1987, as amended), that has been prepared by the Hillsborough County Conservation District.

25+% Slope - Land areas in this category are among the most difficult to develop. A 25% slope represents a 25-foot vertical rise in elevation in a 100-foot horizontal distance, and is twice as steep as the steepest section of Lyndeborough's roads. These areas require extreme care and usually need special engineering and landscaping to be developed properly. The major problem of development on slopes of 25% or more is that generally steep slopes have only a very shallow

layer of soil covering bedrock. Because of this, safe septic system installation is very difficult, storm water run-off is accelerated rather than absorbed, and soil erosion potential increases. Road and driveway construction to steep slope sites is more difficult and costly, and also increases the amount and velocity of surface run-off. Proper safeguards must be applied to such sites to minimize hazards to downslope properties, and these safeguards usually mean costly and often problematic engineering and landscaping solutions.

For these reasons, active use of steep slope sites should be avoided wherever possible or required, or approached with extreme caution and subjected to a thorough review by the Conservation Commission, Town Engineer or designated representative of the safeguards to be employed. If possible, the Planning Board and Town should consider preserving such areas as open space and limiting their use for development.

15-25% Slope - Land areas in this slope category present substantial constraints to development. Development of these areas should only be undertaken with extreme care, recognizing the sensitivity of the environmental factors involved. In general, the steeper the slope, the shallower the soil layer covering bedrock. In addition, the velocity of surface water run-off can increase with the steepness of the slope, thereby increasing the potential for erosion and decreasing the potential for absorption of surface run-off.

The above conditions suggest that on-site waste disposal, and stabilization and landscaping of the site, will be quite costly to be developed effectively. Road construction is also more difficult and costly under these slope conditions and will result in increased amount and velocity of run-off to adjacent roadway areas. If proper safeguards are not applied, substantial hazards and potential damage to downslope property could result. For these reasons, active land uses on these slopes should be avoided or approached with extreme caution.

Areas with slopes greater than fifteen to twenty-five percent are generally found in areas with elevations above 1000 feet and are more suitable for open space. By preserving these areas as open space their absorption capacity is maximized and just allowing the natural vegetative cover to remain in place minimizes the erosion potential.

8-15% Slope - Land areas with slopes in this category present many of the same problems that are associated with the 15+% category. Here too, the high erosion susceptibility and the low absorption potential make site development and subsurface sewage disposal difficult. The severity of these conditions, however, may be less hazardous than on steeper slopes. Overcoming site conditions may also be less costly and difficult on these slopes if approached with caution and sufficient foresight. A closer examination of specific parcels in this category will determine which problematic conditions may be overcome, and at what cost.

0-8% Slope - Land areas in this slope category are generally considered to be well suited for development. These moderately sloping areas are preferred for active use. Their relative flatness does not pose severe erosion potential, and the velocity of the surface water run-off is sufficiently slow to allow absorption of the water into the soil. In addition, soil layers on slopes of zero to eight percent are usually of sufficient depth to allow the absorption and purification of run-off and septic system effluent. (This will, of course, depend on the specific soil conditions found on particular sites with slopes in this category.) Overall, slopes of this nature are capable of supporting a wide variety of land uses.

One exception to the above comments, however, must be noted. Areas of 0-3% slope at low elevations, or with poorly or very poorly drained soils, have been found to have a high water table (at or near the surface) throughout a majority of the year. (Pooling may occur in some

instances.) These areas pose substantial problems to site preparation, construction, and effective subsurface sewage disposal. The Town's Wetlands Conservation District ordinance will be a valuable aid in protecting these areas. But generally, flat, well-drained areas are usually quite suitable for active use and development.

The slope categories, as described above and shown on Map IV-1, Topography, are intended to serve as a general guide to community master planning. They are by no means the final word as to where development should or should not take place. Local variations will require site inspection by the Planning Board, Conservation Commission, Town Engineer or designated representative to determine the existence and severity of problems to be overcome if developed. The slope data should be considered in conjunction with soils and water resource data in determining the overall natural ability of the land to support development.

C. SOILS

Soils are the foundation upon which all land use occurs. Soil conditions are the most important factor in determining the capability of land to support development. They are especially important in Lyndeborough, where the soil material is the sole medium for the purification of all wastewater generated by residents.

The Natural Resources Conservation Service, formerly the Soil Conservation Service (SCS) has devoted extensive time and resources to compiling soil surveys, which analyze the physical and chemical properties of different types of soils (for the duration of this chapter, we will refer to SCS since all of the documents cited refer to this former agency). From this information they have determined the suitability of soils for use, and the limitations and potentials affecting the use of soils for particular purposes.

Of special importance to Lyndeborough is the SCS research on the suitability of soils for use as septic tank absorption fields. Since the Town relies solely on subsurface disposal of wastes, this information is a valuable planning tool in targeting future growth to areas where hazards to the public health will be avoided.

3. SCS Soil Limitation Rating System

For many years, the Town has relied on a soils analysis method prepared by the SCS which examines the various limitations of each soil type relative to the soils effectiveness for subsurface septic system installation and operation. Although a new soil classification system was developed by the SCS recently, it is useful to briefly review the former method, which was used for so many years. For the earlier method, the Soil Conservation Service evaluated the following soil properties in determining the suitability of soils for use with septic tank absorption fields:

1. Permeability of soil;
2. Depth to water table;
3. Depth to bedrock;
4. Steepness of slope;
5. Stoniness/Rockiness of soil; and
6. Susceptibility to flooding.

It has been common practice for communities to require that soil maps and information be submitted as part of a completed application for subdivision or site plan review. A certified soil scientist in accordance with either the High Intensity Soil Map Standards (HISS) or the Order 1 Soil Map Standards prepares these maps. Both Standards are currently being phased out of use by the year 2002.

The Society of Soil Scientists of Northern New England has recently combined the better features of both soils mapping techniques into Site Specific Soil Mapping Standards (SSSMS). The SSSMS meet the criteria of the National Cooperative Soil Survey of the USDA/NRCS. This means that maps prepared in accordance to the SSSMS classify soils to the series level, which is consistent with the maps found in the county soil surveys. The SSSMS are the most current standards available that can be used for a variety of land use activities.

The results of the research were summarized into an overall rating of the soils for the particular use. The rating indicates which soils have slight, moderate, or severe limitations for use with septic systems. The ratings are illustrated on Map IV-2, Soil Type Limitations for Septic Tank Absorption.

Slight Limitation

Soils in the slight limitation class are considered to have the best potential for active uses. They have properties generally favorable for uses involving septic tank absorption fields. The limitations for using soils in this manner are considered to be minor and can easily be overcome. These areas should be capable of active use, pending the consideration of other factors affecting their suitability for development.

Since the Town contains only a small amount of land in this class, efficient use of these areas should be actively encouraged if not required. Innovative zoning techniques can make efficient use of these soils while setting aside less suitable soils for less intensive uses.

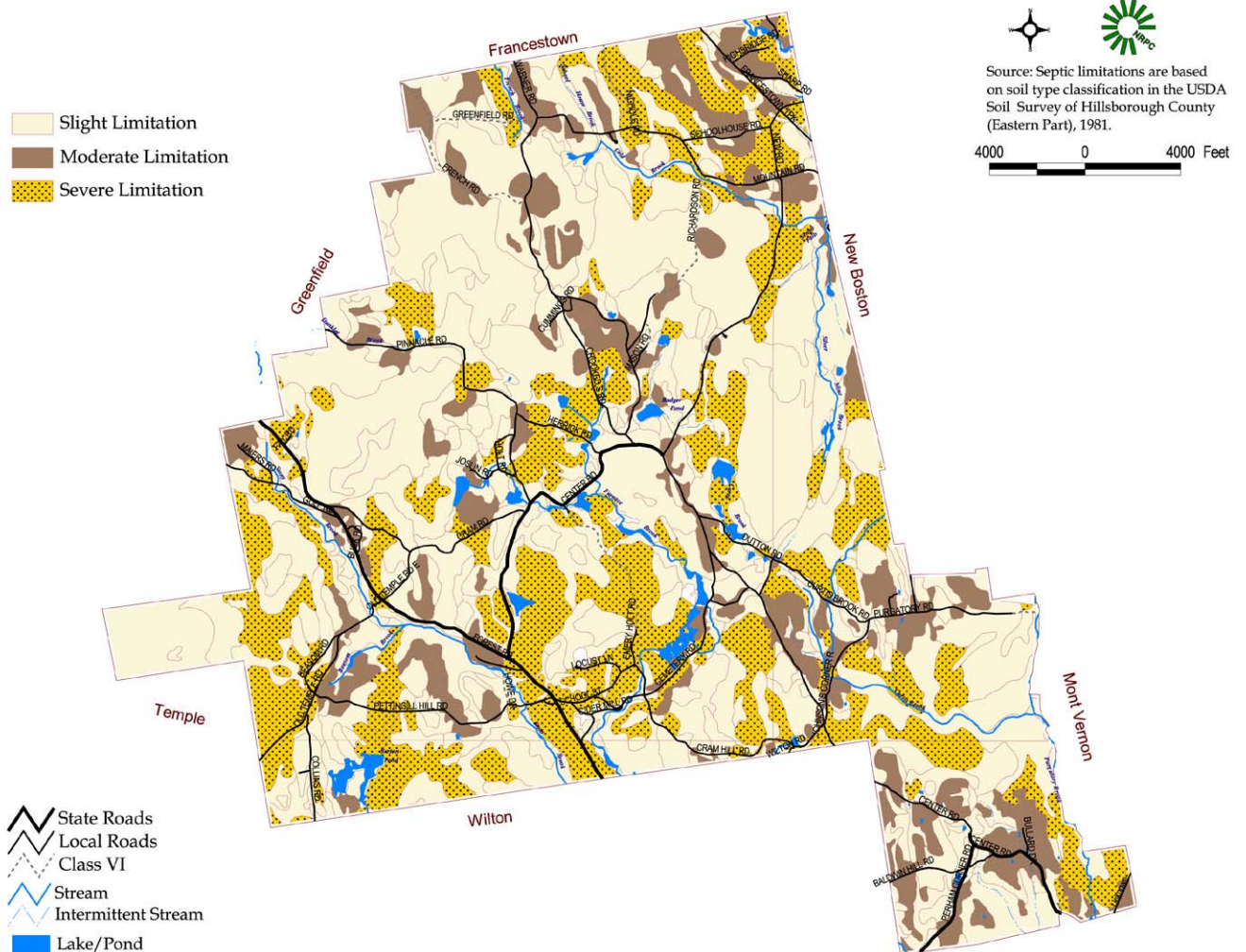
Moderate Limitations

Soils in the moderate limitation class have intermediate potential for supporting septic tank absorption fields. They have properties moderately favorable for septic systems; however, limitations may be overcome through careful consideration and planning in the design and maintenance of septic systems. These areas are identified to alert interested parties that soil conditions do not preclude their development, however, additional consideration and cost may be necessary for development of specific site. Here again, the short supply of land in this class mandates efficiency in its development. Innovative zoning techniques may offer one method of solution; however, such proposals must be sensitive to the limitations, which place these soils in the 'moderate' class.

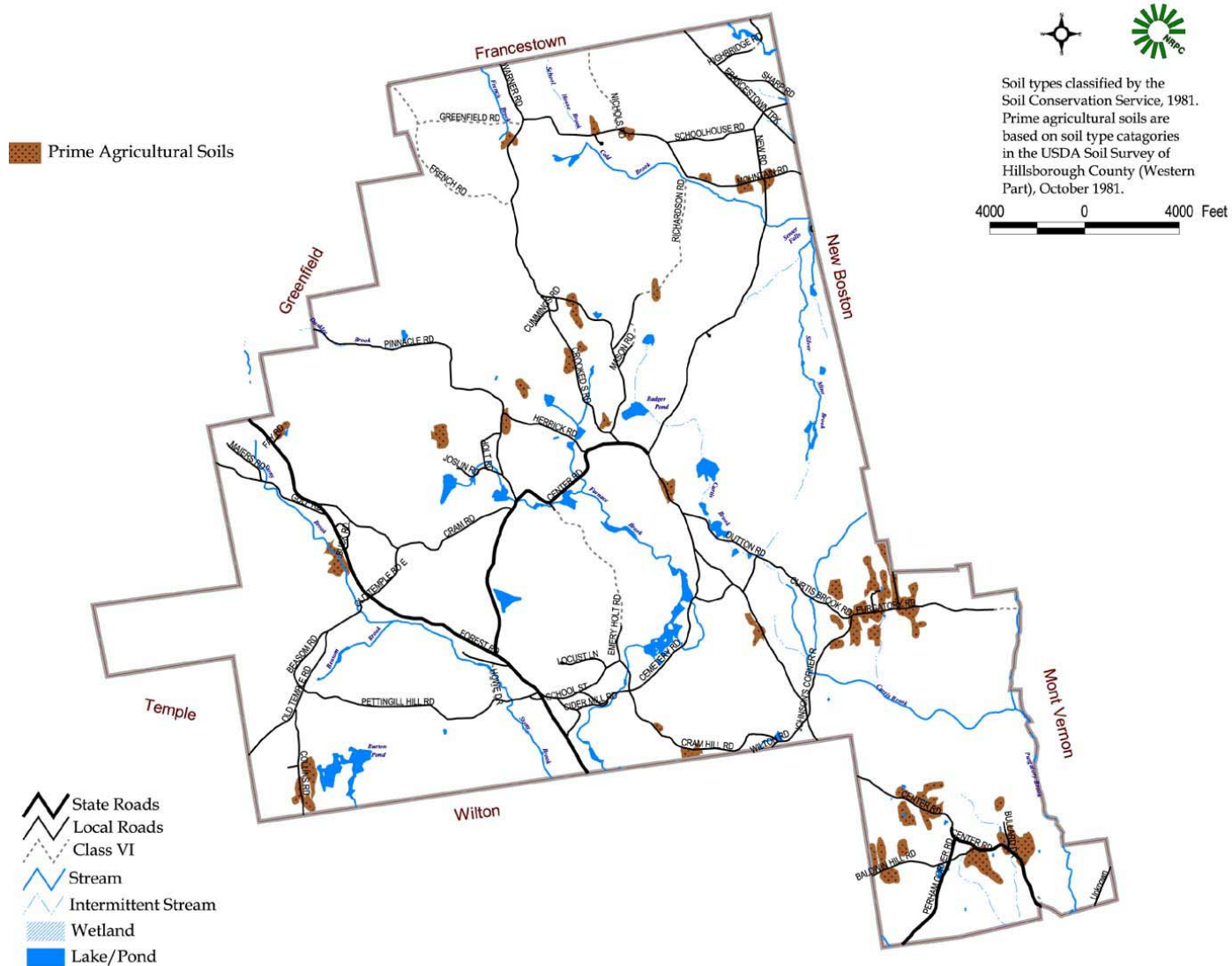
Severe Limitations

The soils in the severe limitation class have the poorest potential for supporting septic tank absorption fields. They have one or more properties that are unfavorable for septic use. This designation, by itself, does not preclude all development but alerts developers and local officials that substantial effort and cost may be necessary to make the site suitable for development. The extent to which corrective measures are required will depend on the individual site and should be ascertained through site inspection by the Conservation Commission, Town Engineer, or designated representative.

Map IV-2: Soil Type Limitations for Septic Tank Absorption



Map IV-3: Agricultural Soils



4. Agricultural Soils

The importance of agricultural lands as a valuable, rapidly diminishing resource has increased at national, state and local levels. Nationally, the U.S. Department of Agriculture estimates that one million acres of farmland are lost each year to the advancing urban sprawl that is sweeping the country. In New Hampshire, more than two-thirds of the State's farmlands have gone out of production over the last fifty years.

By the middle of the nineteenth century, agriculture reached its peak in southern New Hampshire. Approximately 55-65% of Hillsborough County was considered improved farmland at that time; most located in upland areas. In Hillsborough County, some thirty-three percent of agricultural land was taken out of agricultural use over the period from 1952 to 1974. Thirty-two percent of Lyndeborough's agricultural lands fell out of production, either becoming idle or developed for other uses, over the same period.

Active agricultural practices such as horse properties and properties that are not actively managed as farms but are passive open spaces comprise only a small percentage of the total acres in Town. Agricultural uses in Lyndeborough have diminished over the years, and old stone walls in the forests are the only clues to the formerly cultivated lands. The rural picturesque quality attracts new residents to Town. Yet residential development pressure is the very thing that threatens the existence of Lyndeborough's remaining farmlands.

Based on the Community Profile, maintaining the remaining agricultural land is a high priority for the citizens of Lyndeborough. For agriculture to remain in Lyndeborough, the Town must develop innovative regulations, programs and policies beneficial to everyone. One method would be to acquire easements or purchase development rights to preserve agricultural uses. The Town should also seek additional funding sources both inside and outside its own budget to support agriculture. The Land and Community Heritage Investment Program is a good example of such funding. Monies may also become available through the Conservation and Reinvestment Act (C.A.R.A. 701) for farmland preservation. In addition, there is a "Barn Again" Program, which aids rehabilitation and preservation of income producing barns.

As growth continues within the State, so too will the pressures to take agricultural lands out of production in favor of development. A number of factors contribute to the incentive for this conversion of agricultural lands. First, rising land values, and a strong demand for housing, act as an incentive to the development of agricultural lands, many of which are quite suitable for active use and less costly to develop. Additionally, inequitable assessment and taxing procedures act as a disincentive to farming uses (and as incentives for sale of farmland) by placing a heavy tax burden on the farmer. And finally, the farmer's difficulties in obtaining the capital and credit needed to maintain an efficient farming operation hurts his ability to compete with the more affluent developers for the use of the land. It must be recognized that the re-establishment of agricultural uses on land once developed may require an investment of manpower, capital, and technical resources which is highly unfeasible.

For these reasons it is important that steps be taken now to protect the Town's productive farmlands. The local economy provides a market for locally produced goods. In return, local farming operations can provide employment opportunities, and can reduce the cost of food by eliminating a significant transportation cost add-on. Agricultural uses can also be productive uses for flood plains and seasonally wet soils, which are generally unsuitable for development.

The Town's important agricultural soils are illustrated on Map IV-3 and are divided into three groups of important farmlands based on the soil character suitability for crop production.

Prime Farmland - These lands are best suited for producing food, feed, forage, and fiber or soil seed crops. Their soil quality, growing season, and moisture supply make them suitable for producing sustained high yields of crops economically when treated and managed according to modern farming methods. They can be farmed continuously without degrading the environment, and usually require little investment and energy for maintaining their productivity. These soils are rated among the best in the country for farming uses. The SCS has included the following soil types as constituting Prime Farmland: Groveton (27B); Madawaska (28B); Becket (56B); Marlow (76B); Peru (78B); Ondawa (101); Podunk (104); Monadnock (142B); and, Skerry (558B).

Farmlands of Statewide Importance - These lands are rated as being of Statewide importance for the production of food, feed, fiber, forage, and oilseed crops. They are important to agriculture in New Hampshire but exhibit some properties which exclude them from Prime Farmland status (such as erodibility or droughtiness). They can be farmed satisfactorily by greater input of fertilizer and erosion control practices, and will produce fair to good crop yields when managed properly. The SCS has included the following soil types as constituting farmlands of Statewide importance: Becket (56C); Marlow (76C); and, Monadnock (142C).

Farmlands of Local Importance - These lands are rated as having local importance because they are already being actively farmed. Since they are now under active farm management, they are important to the role agriculture plays in the Town's economic, cultural, and conservation picture. The SCS has included the following soil types as farmlands of local importance: Adams (36A, 36B); Becket (57B, 57C); Marlow (77B, 77C); Peru (79B); Rumney (105); Monadnock (143B, 143C); Skerry (559B); and, Croghan (613A, 613B).

Land in the first two classes is considered to be of importance to the food-producing ability of the State. Consideration should be given to steps by which these and the locally important farmlands may be protected and encouraged to remain in agricultural production. LCHIP and CARA, described later in the chapter, could be used to protect important agricultural lands through the acquisition of development rights.

A listing of the soils situated within the Town of Lyndeborough grouped according to their potential for, or limitation to, active use and development is included in Appendix VI-B. The list is intended for use as a reference in reading and understanding the implications of the soils mapping. The list of soil limitation ratings is taken from the previous Master Plan. The list is an aid and may provide an assessment of the soils' suitability for development and to alert officials and developers to the potential problems, which may require attention in the development process. As such, this information should be given primary consideration in the Town's master planning effects.

D. WATER RESOURCES

Water is essential to every element of community life. Like air, water is constantly in motion - running above and below the ground's surface across Town, state and national boundaries. The natural system of water in Lyndeborough is extremely important in planning for growth, as the ground is the sole medium through which septic waste water is purified and from which drinking water is drawn. The safe conduct of both of these practices must be enforced if hazards to the health and well being of community residents are to be avoided. The first step toward ensuring the protection of the Town's water quality is to inventory the water resources and identify their importance to the community.

1. Surface Water Resources



Surface water resources provide storm drainage, storage, groundwater recharge, wildlife habitat, water supplies, and active or passive recreation. The Town's streams, including Stony Brook, Furnace Brook, Curtis Brook, Purgatory Brook, and South Branch Piscataquog River flow into different drainage basins. The two main basins are the West Branch of the Piscataquog (in the northern portion) and Stony Brook (generally in the southern portion of Town).

Lyndeborough's ponds are also a very important surface water resource, providing wildlife habitat, water supply, flood control, and outdoor recreational opportunities. An inventory of Lyndeborough's ponds is presented in Table IV-1 and illustrated on Map IV-4. It was noted in the Town's draft Groundwater Protection Policy Plan that Badger Pond and water bodies located along portions of Cemetery Road contain excessive aquatic plant species. This is generally due to nutrient loading (phosphorous) from agricultural operations or landscaping.

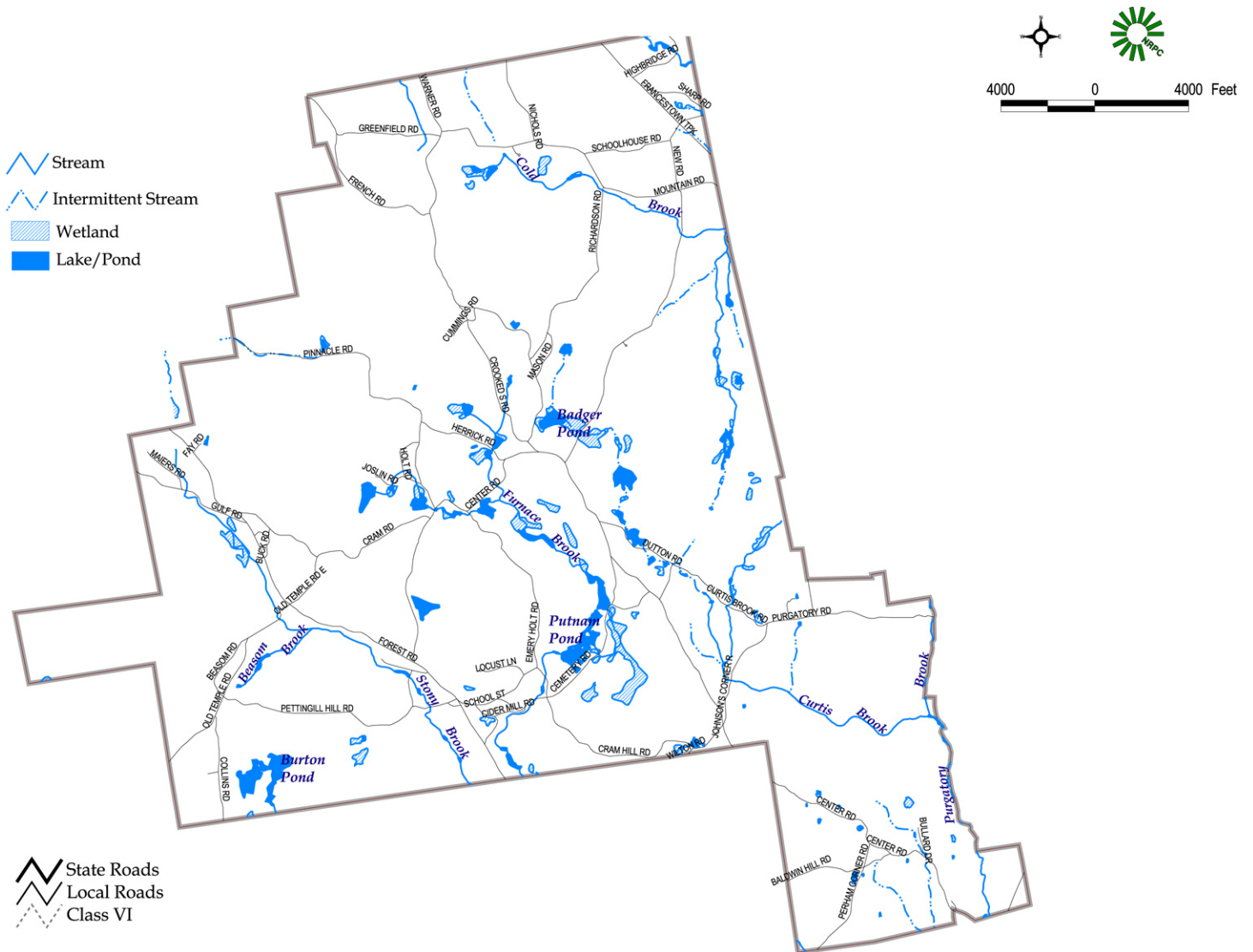
All surface waters are important due to their length, current or potential uses, and the interconnection between surface water and groundwater. Although they may represent a small portion of the Town's land area, they are an important resource to consider relative to the Town's future growth because of the extensive network they form.

Table IV-1: Ponds in Lyndeborough

Name of Water	Size	Description
Badger Pond (private)	Area: 12 acres	Color: colorless
	Elevation: 860 feet	Bottom: 95% muck, 5% rock
	Max. Depth Sounded: 6.8 feet	Emergent Vegetation: common
		Submerged Vegetation: scant
Burton Pond (private)		Shore: 60% wooded, 30% swampy, 5% meadow, 5% cultivated
	Area: 26 acres	Color: brown
	Length: 2.0 miles	
Putnam Pond (public)	Elevation: 870 feet	
	Area: est. 50 acres	Color: dark brown
	Max. Depth Sounded: 6 feet	Bottom: 100% muck
		Emergent Vegetation: scant
Swartz Pond #1 (private)		Submerged Vegetation: scant
	Area: 12 acres	
	Elevation: 935 feet	
	Average Depth: 7 feet	

Source: *Survey Lake Data Summary*, New Hampshire Department of Environmental Services, Water Division, November 2000.

Map IV-4: Water Resources





The importance of surface water resources in the protection of water quality requires that they be treated with care in the land use planning process. It is recommended that land areas adjacent to surface water resources be protected by restricting their development from active use. These areas can be safely developed, however, to meet the community's needs for passive recreation and open space. They will also provide protective greenways that buffer or minimize any land use impacts that may be created by allowed development. This not only protects the water quality, but also enhances the value of the surface water resources by allowing them to continue to support a community of wildlife within and around them. In addition, the connected surface water resource then serves as the basis for a natural system of open space around which development can occur. In Lyndeborough, this would provide open space areas for most of the developable land in Town.

Buffers consisting of a herbaceous layer (groundcover/vines), understory plants consisting of shrubs, grasses, sedges, and trees ranging from 1 to 15 feet, and mature trees are recommended for maximum nutrient uptake and wildlife habitat. The State of New Hampshire has not adopted a standard buffer width. It is generally recommended in scientific literature, however, that a minimum 100-foot buffer be used. There are many considerations when considering the width of buffers including, but not limited to hydrology, topography, and the presence of threatened or rare and endangered species.

The buffers will also provide protective greenways that minimize any land use impacts that may be created by permitted development. This not only protects the water quality, but also enhances the value of the surface water resources by allowing them to continue to support a community of wildlife within and around them. In addition, the connected surface water resource then serves as the basis for a natural system of open space around which development can occur.

2. Groundwater Resources

A substantial portion of water in Lyndeborough is below the ground's surface. Groundwater is water that is stored in the pore or fracture spaces between the individual particles of soil, sand, gravel, bedrock, etc. In essence, the ground acts as a sponge (or more correctly, aquifer) which filters and stores large amounts of potable water. These supplies are tapped by drilling or digging wells to obtain water for domestic consumption. The amount of water which can be obtained in this manner is determined by the nature of the material holding the water. For example, per unit volume of material, sand and gravel deposits generally have a higher potential for yielding large amounts of water than do deposits of till and bedrock.

The three different types of groundwater aquifers include saturated stratified drift, saturated unconsolidated till, and bedrock. Each source varies as to the quantity of groundwater present and how it moves. Each is described in greater detail below.

Stratified Drift Aquifers

Stratified drift aquifers are made up of sand and gravel materials. The materials were deposited by the melting of glacial ice similar to rivers that deposit sand or gravel bars today. The deposits may be quite extensive, and are layered or "stratified". Their coarse texture allows for large volumes of water to be stored and their high porosity allows groundwater to flow through quite readily. For these reasons, stratified drift aquifers are a prime source of water for municipal and other large-volume users as they have a potential to yield large volumes of water to a well. According to the draft Groundwater Protection Plan, primary stratified drift aquifers are not extensive. There are three principle areas in Town capable

of being a primary source of groundwater. These aquifers are located in the northeast portion of Town in the vicinity of the Francestown Turnpike, the Bracketts Cross Road and Putnam Pond Conservation Area, and the residential portion of NH Route 31 to the west.

Water usage will vary depending on the type of development. Single family residential and light commercial development use a relatively small amount of water in relation to higher density residential and heavy commercial and industrial uses. Thus, in the absence of a municipal water supply system, the mapping of groundwater potential can be helpful in deciding where various land uses might be best located and in limiting the maximum amount of growth.

Aquifers are porous and transmit water along with any pollutants or contaminants it may contain. The potential for contamination will depend on the nature and intensity of the uses located over the aquifer and recharge sources in the aquifer. These are uses, which in many cases depend on the aquifer for potable water supplies. The potential for contamination is also further compounded by the dynamic nature of water. Pollutants discovered at one point may originate from a distant water gradient source. Thus, the delineation of aquifers and the drainage basins which feed them can help officials in determining the impact of uses which occupy land areas important to the recharge of groundwater supplies.

The aquifers delineated on the water resources map in the previous master plan were taken from a 1977 study, which identified underground water supply potential according to soil types. Three categories of groundwater sources were identified:

High Potential - Wells located within these areas by systematic groundwater exploration should yield sufficient quantities of water to meet or augment municipal and industrial requirements.

Medium Potential - Shallow wells and infiltration galleries located in these areas by systematic groundwater exploration should yield sufficient water for small municipal and rural water districts, commercial and light industrial use.

Low Potential - These areas, in which hardpan and ledge are at or near the surface, have low potential to yield water. Wells in till and bedrock commonly yield sufficient water for single family domestic use. In places where wells penetrate saturated zones or fractures in bedrock, wells may yield more than 40 gals./min. Wells in these areas will not support large sustained yields.

Since the previous master plan was prepared, another more detailed study of the glacial stratified drift aquifers within the Nashua Region was published by the U.S. Geological Survey in 1987. The Aquifer Delineation Study for the Nashua area is an expansion of the USGS Groundwater Availability mapping. Based on the hydrogeologic information supplied by this earlier study, the USGS first considered the availability of existing hydrogeologic information in and around these potential areas. Additional field mapping, well borings (50), and material sample testing were conducted to fill data gaps. Field work included twenty-two seismic refraction lines (a combined total length of almost eight miles). This was done to provide depth-to-water-table and bedrock subsurface information.

Due to the unpredictable nature of till and bedrock aquifers and the cost of exploring them geophysically, they were not included in this study. This study covers only stratified drift deposit aquifers located within the region. The principle new data developed in this study include: the location and extent of watershed areas; the location and extent of the stratified drift material (both surface area and depth); water table elevation; saturated thickness of stratified drift deposits; individual aquifer characteristics including type of material, transmissivity and direction of groundwater flow; and, groundwater quality sampling results.

Location and Extent of Watershed Areas - As mentioned previously, surface water and groundwater are interrelated. Precipitation falls in areas referred to as watersheds formed by a series of connecting ridges. Surface water, flowing through a system of interconnected wetlands, brooks, streams, rivers, is encompassed by a drainage basin or watershed. A watershed can be subdivided into smaller subwatersheds..

Watersheds are particularly important to consider when production wells are located adjacent to surface water bodies. Watershed management and protection may provide a framework for a comprehensive water resource strategy, of which aquifer protection is but a part. However, caution should be exercised in the use of watershed protection exclusively as a groundwater strategy.

Groundwater is recharged in stratified drift aquifers in two ways. The area of direct recharge is the land surface directly overlying the stratified drift deposit. Water infiltrating the earth materials within this area has a "direct" route to the groundwater resource. The indirect recharge is the land surface outside the direct recharge area, but within the surrounding watershed, which contributes water to the groundwater system.

Location and Extent of Stratified Drift Deposits - Location and extent of stratified drift deposits is determined from existing surficial geology mapping, SCS Soil Survey information, and additional fieldwork. The extent of these deposits are delineated on a USGS 7.5 minute (7.5'), 1:24,000 scale (one inch = 2000 feet) topographic base map.

The map line showing the deposit boundary actually represents the location where the composition of the glacial deposit changes from stratified drift to till or bedrock. The actual width of this change (represented by a line on the map) may vary. In some cases, the geologist conducting the surficial geology mapping noticed a "clean break," while in other instances a "transition zone" was identified.

The depth of existing stratified drift deposits is important information used in evaluating an aquifer. To determine this, the hydrogeologist does "seismic profiling" while in the field. From the results of this field work a subsurface profile or cross-section is developed. Using numerous seismic lines and consulting other data, a better picture is put together of what actually exists below the ground.

Water Table Elevation - Water table elevation is the position of the water table in relation to the Mean Sea Level reference point. Similar to mapping the ground surface with topographic contours, the water table is mapped in feet above Mean Sea Level (ft. AMSL). The water table contour interval (vertical space between lines) is ten feet.

The contour information was developed from seismic profiling, well completion and test boring reports. These reports have limitations that the hydrogeologist must incorporate into the analysis. These include seasonal variations of well measurements, the effects of nearby pumping wells, and the reliability factor of well completion reports submitted to the NH Water Well Board (WWB).

Saturated Thickness of Stratified Drift Materials - From the information provided on the maps, it is possible to determine how far one would have to dig through the unsaturated materials to hit the water table. A location is identified from the topographic contours, and then the ground surface elevation established (e.g., 350 ft. AMSL). Then the water table elevation is subtracted from the ground surface elevation. This results in the number of feet of unsaturated material (e.g., 350 ft. - 300 ft. = 50 ft.).

Saturated thickness is determined by combining depth to bedrock and water table level information. Within the total thickness of a stratified drift deposit, this is the zone of saturation. Saturated thickness is shown on the aquifer maps using contour lines of 10, 20, 40, 60, 80, and 100 feet.

Material Type, Transmissivity, and Rate and Direction of Flow - The type of material (fine, coarse, sand, gravel, etc.) is an important factor in determining the quantitative characteristics of an individual aquifer. In classifying aquifers for this study, the hydrogeologist mapped four categories of material type: predominantly coarse; predominantly fine; coarse over fine with coarse materials over 25% of total thickness; and, fine over coarse with buried coarse materials at least ten feet thick.

The capacity of an aquifer to transmit water is referred to as its rate of transmission, or transmissivity. A transmissivity value for an aquifer is determined from the material samples test data. Aquifer transmissivity values are mapped using contour lines representing 0-2, 2-4, 4-8, and over 8 thousand square feet per day. The greater the "T" value, the more groundwater the aquifer will transmit.

Velocity or rate of groundwater flow is also a function of material type, porosity, and slope (hydraulic gradient) of the water table. Very coarse (porous) materials with steeper hydraulic gradients are expected to have higher anticipated rates of flow. In reverse, finer (less porous) materials with flatter hydraulic gradients are expected to have lower rates of flow.

Direction of flow is determined from reading the groundwater table contours. Groundwater flow does not always follow surface topography so having water table contour information will help alleviate the guesswork. Arrows are used to show direction of groundwater flow on the maps.

Groundwater Quality Sampling Results - Groundwater quality monitoring was performed in conjunction with USGS fieldwork. Testing of samples collected was made possible through EPA grant funds. A total of 46 water samples were tested. The results show that overall water quality in the Nashua region is very good. Localized groundwater contamination incidents have been recorded at certain sites within the region. These incidents have been associated with specific land use problems on or near the site. The water quality study done for the region analyzed past information, located new sampling sites, performed ureter quality testing, and prepared final analysis, findings and recommendations. The one well tested in Lyndeborough was found to have levels of Sodium (Na) slightly higher than the USEPA recommended Toxic Contaminant Level. The domestic well was shallow, and likely contaminated by either road salt or septic leachate which are both a possible source of Sodium.

The following excerpt is the USGS aquifer study description of Lyndeborough's stratified drift aquifers:

"Only 2.4 ml² or 8 percent of the Town is underlain by permeable stratified drift. In a few places, the saturated thickness of stratified drift exceeds 10 ft.; therefore, most deposits seem to be incapable of yielding more water than may be required for residential use."

The small, thin aquifers in Lyndeborough are widely scattered and discontinuous. In the Piscataquog River, Curtis Brook, and Stony Brook valleys, the stratified drift in kame terraces and eskers is thick, but the saturated thickness is too small to support large well yields; possible exceptions are stratified-drift deposits along the Piscataquog River east of Piscataquog Mountain and those northeast of Piscataquog Mountain near Wilton Road in New Boston, where the saturated thickness, is less than 20 ft. and the transmissivity is less than 4,000 ft.-/d. However,

exploration to determine if sites for large yielding wells are possible would be desirable. The limited extent and saturated thickness of the stratified-drift aquifers in Lyndeborough indicates that a large-capacity municipal water-supply system is not likely to be located in the Town. Use of the small, isolated stratified-drift aquifers, which generally have transmissivities less than 2,000 ft./d, is suited for individual household water supplies.

Till Aquifers

Till aquifers are also made up of glacial deposited earth materials. The main differences between till and stratified drift aquifers are material porosity and thickness. Till is a mixture of clay, silt, and gravel materials. These materials were ground-up from solid rock by the glacier. Little groundwater can flow easily through such small individual pore spaces. In addition, till was deposited by glaciers on the tops and sides of valleys, making till deposits relatively thin compared to those of stratified drift. Wells drilled in till usually yield only small volumes of groundwater which may be adequate for private residential use.

Aquifers composed of glacial till materials may not be considered as good a water supply source as stratified drift aquifers, but for individual home owner needs they may supply shallow drilled or dry wells with marginal to adequate water yields. For the most part, those areas within Lyndeborough not mapped in the USGS aquifer study, would be considered as till deposits. There may also be small, scattered areas where bedrock is not covered by glacial till and is exposed at the surface. Glacial till deposits also have been mapped and can be delineated using USGS and Dept. of Resource and Economic Development (DRED) surficial geology maps. The SCS Soil Survey also lists those soil series, which likely have developed from glacial till deposits. These soil series and their corresponding soil symbols are showing in Table IV-2.

Table IV-2: Glacial Till Soils

Soil Series	Soil Symbols
Becket	56B, 56C, 57B, 57C, 57D
Lyme	246B, 247B
Marlow	76B, 76C, 76D, 77B, 77C, 77D
Monadnock	142B, 142C, 143B, 143C, 143D, 145C, 145D
Peacham	549
Peru	78B, 79B, 79C, 79D
Pillsbury	646B, 647B
Skerry	558B, 559B, 559C
Tunbridge-Lyman-Monadnock Complex	160B, 160C, 160D
Lyman-Tunbridge Rock Outcrop Complex	161C, 161D

Source: *Soil Survey of Hillsborough County New Hampshire, Western Part*, United States Department of Agriculture, Soil Conservation Service, October 1981.

In those areas not mapped as stratified drift, any water supply wells relying on till deposits will be shallow in depth, and possibly seasonal in duration. The water table levels and yields will likely fluctuate greatly, corresponding to the seasonal variations in precipitation and drought. Because these wells are also close to the surface of the ground, they are very susceptible to land use related contamination (septic systems, fuel storage, fertilizers, road salt, etc.). The Town should consider increasing the setback of future land-uses to these water supply wells in order to prevent the unnecessary contamination of individual water supplies.

Bedrock Aquifers

Bedrock aquifers are composed of fractured rock or ledge, where groundwater is stored in the fractures. These aquifers are very complex because bedrock fractures decrease with depth, "pinch out" over short distances, and do not carry much water. Wells drilled in bedrock that do not hit a fractured area will come up dry. If the well encounters an extensive fracture system, then groundwater yields may be high. On the average, bedrock aquifers yield smaller volumes of groundwater than wells drilled in stratified drift.

As mentioned above, it is the fractures in the solid bedrock that carry groundwater. Unfortunately, locating bedrock fractures requires high-technology fieldwork and is very costly. Bedrock fractures are also hard to locate because of all the glacial material that may be covering them. The presence of fractures also depends on the type of bedrock involved and depth.

Bedrock aquifers are recharged from the same source as stratified drift and till aquifers. Surface water can directly enter the fractures exposed at the surface, or soak into the overlying material and then enter any fractures that may exist along the material-bedrock contact. The latter is the main way bedrock aquifers are recharged. Knowing just where this takes place for a particular fracture or fracture zone is extremely difficult, primarily due to the complex interconnecting nature of fractures, and the large area they may cover (e.g., an entire watershed).

Locating water supply wells in bedrock is often a hit or miss proposition. If you are drilling in a high fracture area, then there is a good chance your well will intercept a fracture and yield sufficient quantities of water. However, if the bedrock is not highly fractured, the chance of hitting a fracture decreases substantially. According to the Town of Lyndeborough Groundwater Protection Policy Plan, the area along the Pinnacle Fault has the potential to produce high yielding bedrock wells due to its distinct and geologic site specific conditions. The fault is located in the eastern portion of Town and runs in a more or less north/south direction.

Since Lyndeborough has little stratified drift or till aquifers available, bedrock aquifers are a viable and already highly used option for providing individual water supplies. Again, due to the complex nature of bedrock aquifers, the Town should be cautious about allowing existing and future land uses to dispose of waste products that may find their way into surface water and groundwater supplies.

3. Water Supply

There are five known public drinking sources: Lyndeborough Central School, Citizens Hall, the Town Library, Babes in School Land Preschool and the United Church, and the Old Town Hall on Center Road. The Nashua Regional Planning Commission indicates that, overall, water quality and current supply are adequate with few reported incidents of well failure or contamination. Two homes along NH Route 31 complained of road salt contamination of their water supplies. Subsequent testing of the wells verified the complaints. The contamination was attributed to the close proximity of the wells to the roadway.

All water supplied to Town residents comes from groundwater sources. These private systems are usually bedrock water supply wells, dug wells and some springs. In general, bedrock systems are capable of yielding sufficient potable water for individual household consumption.

Several groundwater supplies within the Town's boundaries are suspected to be of sufficient size to yield substantial amounts of water. Normally, supplies of this nature are targeted for potential use for small municipal water supply systems. In Lyndeborough however, such consideration seems unfeasible, as the development costs for such a system would be prohibitive due to the difficult terrain throughout

much of the Town. Also, in an era of declining state and federal assistance for such a project it is impractical to assume that a Town of Lyndeborough's size could bear the financial burden of developing a community water supply. And finally, it appears unlikely that future development in Town will occur in the intensity which would require a public water supply to be developed. However, consideration should be made to the potential for future light industry in the currently designated and undeveloped Light Industrial Zoning districts.

The presence and location of these major groundwater supplies however, deserves consideration in the Town's planning efforts. Map IV-4, Water Resources, indicates areas of groundwater favorability. It should be noted that all groundwater supplies are connected and thus contamination of one supply will - over time - lead to the contamination of other supplies in varying degrees. The Town then should be conscious of this in its planning efforts and take steps necessary to protect these major sources of groundwater.

The most important steps that can be taken by local officials to protect groundwater supplies should be aimed at minimizing, if not eliminating altogether, polluting uses and activities on the land located directly over major groundwater supplies. A recent study conducted by the Nashua Regional Planning Commission, on behalf of the NH Office of State Planning, was concerned with inventorying existing "non-point sources" of pollution. Non-point sources are those polluting activities, which cannot be identified by a specific point or location. (For example, a pipe discharging raw sewage or chemicals into a stream would be a "point source", while a local landfill would be a "non-point source." Non-point sources of pollution can be just as damaging to water quality as point sources.

The study inventoried local salt storage locations, active and inactive landfill sites, road salting routes, and areas of intensive development not serviced by a public sewer system. Information from the study indicates that currently, every major groundwater source in Lyndeborough lies below roadways that are salted on a regular basis during winter months. While it is evident that the Town's terrain can make roads covered with ice or snow hazardous, it should be recognized that current road salting practices represent a potential threat to the Town's groundwater sources.

Since the Town must rely on groundwater sources for present and future supply, it must also take a serious look at ways to protect the supplies from potential pollution sources in all areas that are tied into the groundwater system - including wetlands, floodplains, surface water bodies and water courses and adjacent lands, and lands located over major groundwater sources. Potential pollution uses which have been commonly acknowledged to date include road salt storage and application; municipal and private landfill operations; subsurface sewage disposal systems (especially faulty or overused systems, and a concentrated number of systems in one location); underground storage of bulk oil, gas, or other polluting substance; and large agricultural uses which entail pesticide/fertilizer operations and concentrations of organic pollutants such as manure.

In the interest of protecting the public supplies of water, local officials may deem it beneficial to restrict or prohibit some or all of the above practices in certain areas of Town. While this is recognized as restriction of the individual property-owner's rights of ownership, it also must be recognized that such actions are invoked to protect the public health and well-being of present and future generations, and such restrictions are imposed with the specific purpose and intent of preserving the public welfare.

4. Sewage Disposal

In Lyndeborough, it is impossible to study the future of the Town's water supply without simultaneously considering the impacts of current sewage disposal methods. As in most rural communities, the sole means of disposal in Lyndeborough is through subsurface sewage disposal systems on each individual home site. The Soils map, which accompanies this report and indicates the

Soil Conservation Service's determination of the suitability of soil types for use as septic tank absorption fields, shows that only a small percentage of the Town's area is comprised of soils which have a high or moderate suitability for such use. Consideration of this information will be important in making decisions on the locations of future land uses. This is especially true in Lyndeborough where water supply and sewage disposal both relies on the natural capabilities of the soil.

It seems unlikely that Lyndeborough will ever undertake the development of a municipal sewage treatment facility. In areas where there are multiple wells and aging/failing septic systems, community septic systems should be investigated. Excessive costs and the lack of financial resources locally are the primary reasons for this determination, however, it does not appear that the demand or need for such a facility will be present at the level and type of growth anticipated. The above determination emphasizes the need for the Town to closely monitor sewage disposal practices in order to protect local water quality.

The New Hampshire Water Supply and Pollution Control Commission (WS&PCC) has developed minimum standards for the design and construction of subsurface sewage disposal systems. The WS&PCC is, in fact, the permitting authority, statewide, responsible for reviewing and approving all proposed facilities for the treatment of wastes. As such, it is constantly under fire from local authorities and developers alike for alleged inconsistencies and problems in its approval and enforcement activities. The WS&PCC, has made it clear that the regulations it administers are minimum guidelines that are enforceable statewide, and individual municipalities are encouraged to enact more stringent guidelines which are more sensitive to local conditions.

RSA 36 and RSA 147 empower communities to develop Health Codes that they feel are applicable to its own particular circumstances. Thus, if deemed beneficial, Lyndeborough could enact health ordinances governing the design, inspection, construction, repair and replacement of subsurface disposal systems as a means of protecting local water quality. If such an ordinance were adopted, the Town would then take on the responsibility of administration and enforcement, as well as defense of legal challenges. This latter condition presents problems in that the financial and manpower resources for administration and enforcement are not readily available.

It is recommended that the Town begin to explore the means by which sewage disposal practices may be regulated at the local level. Several examples of local regulation exist in the southern New Hampshire area, and can serve as models for the Town to study. In studying the various approaches used elsewhere, local officials should consider how these approaches can be applied in Lyndeborough and what level of resources are needed to be committed to ensure that local regulation is effective in protecting water quality.

5. Floodplains

Floodplains are areas adjacent to watercourses and water bodies, which are susceptible to the natural phenomenon of flooding during periods of high run-off. Flooding is the process through which the exchange of water from surface to groundwater stores is accomplished. The unpredictable nature of flooding requires the application of precautionary measures to avoid substantial damage to life and property in areas susceptible to floods. Areas of potential flooding in Lyndeborough are identified as Zone A Special Flood Hazard Areas on the US Dept. of Housing and Urban Development, Flood Hazard Boundary Maps. Special Flood Hazard Areas in Lyndeborough are minimal and are located along the edges of Purgatory Brook, Curtis Brook, South Branch Piscataquog River, Burton Pond and Stoney Brook where it parallels Boston and Maine RR.

Due to the small amount of land in Town which is susceptible to flooding, the Federal Emergency Management Administration (FEMA), Federal Insurance Administration has not prepared a flood insurance study of the community. The areas delineated as Zone A on the existing map were identified

by soil information. The Town is not currently enrolled in the National Flood Insurance Program. The New Hampshire Office of State Planning (OSP) administers the program for FEMA and is in the process of visiting all towns in the State that are not enrolled in the Program.

6. Riparian Buffers/Streamside Forests

The riparian buffer traps pollutants and helps filter out sediment and debris from surface runoff. The vegetated buffer also slows the velocity of water and promotes groundwater recharge. The groundwater then returns to the stream or river at a much slower rate and over a longer period of time. This helps control flooding and helps maintain stream flow during the driest time of the year. The buffer helps to stabilize streambanks and reduce erosion and sedimentation. Buffers are essential for cold water fisheries (trout/salmon) to increase shading to moderate water temperatures.

7. Wetlands



Existing wetlands include those areas where the soils are particularly sensitive to development. Wetlands perform many functions within the hydrologic system of each watershed. Wetlands provide: a vital link between incoming precipitation and aquifer recharge; flood storage and prevention; erosion control; and water purification of sediment, contaminants, and problem nutrients. They also provide important habitat to a variety of vegetation and animal life, including: aquatic plants, insects, amphibians, fish, and waterfowl. The role education plays in understanding the importance and sensitivity of wetlands cannot be

overestimated. Promoting the development of school and public environmental education programs that utilize the outdoors as natural classrooms is one way of increasing community awareness.

The designation of wetland areas is the first step in developing any kind of protection plan or strategy. Wetland designation involves determining the location or extent of any areas that support typical wetland soils and vegetation. The existence of either wetland soils or vegetation is the result of water table characteristics which cause frequent flooding or saturation of the soil. In Lyndeborough all poorly or very poorly drained soils and field indicators for identifying hydric soils are contained in the Wetlands District.

Nothing can replace the field survey when it comes to identifying wetlands. Trained botanists, ecologists, wetland scientists, soil scientists, and hydrologists, when working in the field, can provide the highest level of information needed. If available, this information should be incorporated into any land use decision-making process. However, the reality of most local Planning Boards is that the costs involved greatly outweigh the applicability of using this approach in developing an information base.

There are two sources of information and technical assistance presently available to local Planning Boards. One is the Hillsborough County Soil Conservation District and SCS Soil Survey. The other is the US Fish and Wildlife Service, National Wetlands Inventory classification system and map products.

Significant technical and scientific expertise has gone into the development of the Hillsborough County Soil Survey. The District also offers technical assistance at the local and regional levels to make the best use of this information. In mapping the region's soils, the SCS has delineated those soils having poor to very poor drainage based on individual soil properties. Soils in these categories include:

Table IV-3: Poor to Very Poor Drainage Soil Types

Very Poorly Drained Soils	Poorly Drained Soils
Borochemists (197)	Lyme (246B, 247B)
Chocorua (395)	Naumburg (214A, 214B)
Greenwood (29S)	Pillsbury (646B, 647B)
Peacham (549)	
Searsport (15)	

Source: *Soil Survey of Hillsborough County New Hampshire, Western Part*, United States Department of Agriculture,
Soil Conservation Service, October 1981.

The proximity of these soils to low-lying areas or to surface waters is evidence supporting the sensitivity of these areas and their importance as wetlands. The amount and location of incoming run-off, slopes, accessibility of natural drainage features, and seasonal wet conditions are all important points to consider in documenting the importance of sensitivity of a particular wetlands.

Map IV-4, Water Resources, illustrates the SCS wetland soils that exist within the Town. From this map, major concentrations of these soils are found to exist. Wetland areas are for the most part located adjacent to or very near open water as found in the Town's rivers, streams, and ponds. This relationship is the result of a localized higher water table and the source of greater quantities of soil water during periods of high stream flow. There are also some scattered pockets of wetland soils throughout the Town, usually at the bottom of low-lying areas or depressions.

The next step in protecting wetlands would be to set the priority of wetland areas based on their location and the need of the benefits they provide. For example, wetlands adjacent to a stream may warrant a higher priority for protection than an isolated wetland "pocket". The outcome of these efforts would be a protection plan or strategy involving where and how protection is needed. The Town has already adopted a wetland protection ordinance which designates permitted uses within the District, however, the ordinance does not provide for a buffer to ensure that natural vegetation critical to the health of the wetlands is protected. Buffers serve as a pollution filter helping to maintain water quality within the wetland, which is important for all wildlife, both aquatic and terrestrial. Many species are dependent on aquatic habitat or the vegetation bordering the water for nesting or feeding. Information on the type and size of buffers can be found in various national and state publications¹. Other available ways to gain better control of wetland areas considered important would be through Town regulations, conservation easements, deed restrictions, and the fee-simple purchase of development rights or land. Since overcoming the problems in the development of sites with these conditions is quite costly, and since hazardous conditions may result if improperly developed, these areas are recommended for use as open space. This restriction will allow these areas to continue their functions as unique wildlife habitats and as natural purification sites for the recharge-discharge of groundwater supplies.

Currently, little or no development has taken place in wetland areas in Lyndeborough. It is recommended that development of these areas continues to be restricted in the future through the Town Wetland Conservation ordinance and that the ordinance be amended to include a 100 foot buffer from the edge of the wetland. This, combined with active enforcement of Town's regulations governing the location of septic systems (100 feet) , will ensure that these areas may continue to perform the natural functions for which they are best suited.

¹ See: US Department of Agriculture, Forest Service, *Riparian Forest Buffers*, 1992, publication #NA-PR-07-91 and NH Office of State Planning, *Buffers for Surface Waters and Wetlands*, 1997.

Prime Wetlands

State law (RSA 482-A:15) authorizes a community to designate wetland areas meeting established standards as prime wetlands. The criteria and the submission requirements are explicitly set forth in the administrative rules governing the Department of Environmental Services Wetlands Bureau. The benefits of prime wetland designation include:

- Identifying and recognizing wetlands as locally significant based on their size, unspoiled character, diversity of flora and fauna, water storage capacity in combination with other characteristics.
- Notifying landowners, developers and the New Hampshire Wetlands Board of the municipality's strong belief that certain wetlands should remain undisturbed.
- Assuring that the Wetlands Bureau will give additional consideration to proposals for activities within a designated prime wetland.

A few points about prime wetlands should be noted. First, prime wetland designation can only apply to very poorly drained soils. Second, the Conservation Commission must notify the Wetlands Board when a proposal would involve a designated prime wetland. The Town should undertake a Prime Wetland inventory to give these wetlands additional consideration by the Wetlands Bureau when development proposals are presented to the Town.

8. Threats to Surface and Groundwater Resources

Rivers, streams, lakes, ponds and groundwater resources face a myriad of threats. The two main categories of pollution are point source and non-point source pollution. Point sources of pollution are those that can be traced back to an identifiable source, such as a pipe or sewer outfall. Non-point sources of pollution are more diffuse in origin, such as agricultural and urban stormwater runoff, septic system effluent, snow dumps, road salt, soil erosion, etc. The State of New Hampshire, Department of Environmental Services, in its publication "New Hampshire NonPoint Source Management Plan", lists the various forms of non-point source pollution in order of priority for abatement efforts. The list is based on the following factors:

- Danger to public health
- Magnitude and pervasiveness of the potential threat
- Potential impacts to receiving waters
- Professional judgement
- Ability of existing regulatory programs to control pollution
- Adequacy of existing education programs to promote pollution control
- Public perception
- Comments of Non-Point Source Management Plan Subcommittee

The list, in order of priority, is: 1) Urban (stormwater) runoff; 2) Hydrologic and habitat modifications; 3) Subsurface systems; 4) Junk, salvage, and reclamation yards; 5) Construction activities; 6) Marinas; 7) Road maintenance; 8) Unlined landfills; 9) Land disposal of biosolids; 10) Land disposal of septage; 11) Agricultural activities; 12) Timber harvesting; 13) Resource Extraction; 14) Storage tanks (above ground and underground); and 15) Golf courses and landscaping.

This section briefly examines some of the issues and trends in point and non-point source pollution and actions that can be taken to address this pollution. The focus is on non-point source pollution, and urban runoff in particular, now acknowledged as being the most serious threat facing surface and groundwater resources today. The recommendations that follow this discussion will mention several “best management practices” (BMPs) that address non-point source pollution and stormwater runoff in particular. BMPs are variously defined as technical guidelines for preventing pollution caused by particular activities and recommended treatment or operational techniques to prevent or reduce pollution. Map VI-5 shows the location of actual and potential point and non-point pollution sources in Lyndeborough.

Some of the major sources of surface and groundwater contamination in Lyndeborough include: 1) stormwater runoff; 2) subsurface sanitary waste disposal; 3) underground storage tanks; 4) waste sites; and 5) road salt.

Stormwater Runoff

The development of land for residential, commercial or industrial purposes necessarily increases the amount of impervious surface area within any given site due to the construction of buildings, roads, driveways, parking lots and other improvements. Impervious surfaces reduce the natural infiltration of stormwater into the ground, thereby, reducing recharge of groundwater resources. This is particularly true where stormwater is discharged into a storm drainage system that exports stormwater off of a site and out of a watershed. Development can also reduce groundwater recharge through increased evaporation that can result from land clearing. Where increased imperviousness results in direct stormwater discharges into streams and rivers, the result is often alteration of the natural flow of the stream, causing erosion and sedimentation, loss of aquatic wildlife habitat and increased flood hazards. Stormwater runoff is also a principal nonpoint contamination source of surface and groundwaters.

Potential contaminants found in stormwater runoff include: nutrients, such as phosphorous, nitrates, heavy metals, floatables and solids, pathogens such as virus and bacteria, organic compounds including oils, grease, MBTE, and pesticides and herbicides. All of these materials singly and in combination can lead to the degradation of surface and groundwater.

The United States Environmental Protection Agency (EPA), through a program called the *National Pollutant Discharge Elimination System* (NPDES), aims to prevent and control non-point pollutant sources. The first phase of this program, appropriately referred to as the “Phase 1 Stormwater Rules”, regulated the municipal stormwater systems and discharges of medium and large municipalities (those with populations greater than 100,000). As Lyndeborough is a small rural town, these rules do not apply. However, they should be considered for any future industrial development that may occur in the Light Industrial Zoning district. Approximately 105 acres of this district is located adjacent to the Purgatory Brook.

Similar to Phase I, the Phase II rules do not currently apply to the Town but should be used as guidance for site development review. Phase II, which go into effect in March of 2003, will focus on stormwater systems within the urbanized areas of municipalities with populations less than 100,000. In addition, the Phase II rules will also impact construction activities between 1 and 5 acres, whereas Phase I regulated construction activities of greater than 5 acres. In order to comply with Phase II requirements, regulated municipalities must submit a Notice of Intent (NOI) by March 2003. This NOI must include a stormwater management plan that addresses the six minimum control measures required by the EPA. The six minimum control measures are:

1. Public education and outreach
2. Public participation and involvement

3. Illicit discharge detection and elimination
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention and housekeeping.

The Phase II rules mention the “operator”, who is the entity responsible for maintaining stormwater conveyances and drainage systems. Stormwater conveyances include anything that can carry water, including ditches and swales. In most communities, these activities fall under the purview of the Department of Public Works or Highway Department. The New Hampshire Department of Transportation will be responsible for all State roads regardless of the size of the community.

The stormwater management plan must be designed to reduce the discharge of pollutants to the maximum extent practicable (MEP), to protect water quality, and to satisfy the water quality requirements of the Clean Water Act. Though stormwater management plans must be submitted by March, 2003, full implementation is required by 2008, giving communities 5 years in which to carry through with their plans.

Subsurface Sanitary Waste Disposal

Septic system failures from improper design, installation, or maintenance allow nutrients, particularly nitrogen and sometimes bacteria and viruses to leach into water resources. The first receptor of these contaminants is often a nearby private well, but surface waters may also be affected. Septic system leachate, along with stormwater runoff, may contribute to excessive algae growth in surface waters which, in turn, decreases the amount of oxygen available to fish, decreases sunlight penetration and clogs waterways. In most cases, older septic systems and cesspools pose the greatest threat to groundwater and surface water quality. The EPA considers new systems meeting today’s heightened standards to be passive and durable systems that can provide acceptable treatment despite a lack of attention by the owner.

All of Lyndeborough is served by on-site sanitary waste disposal systems.

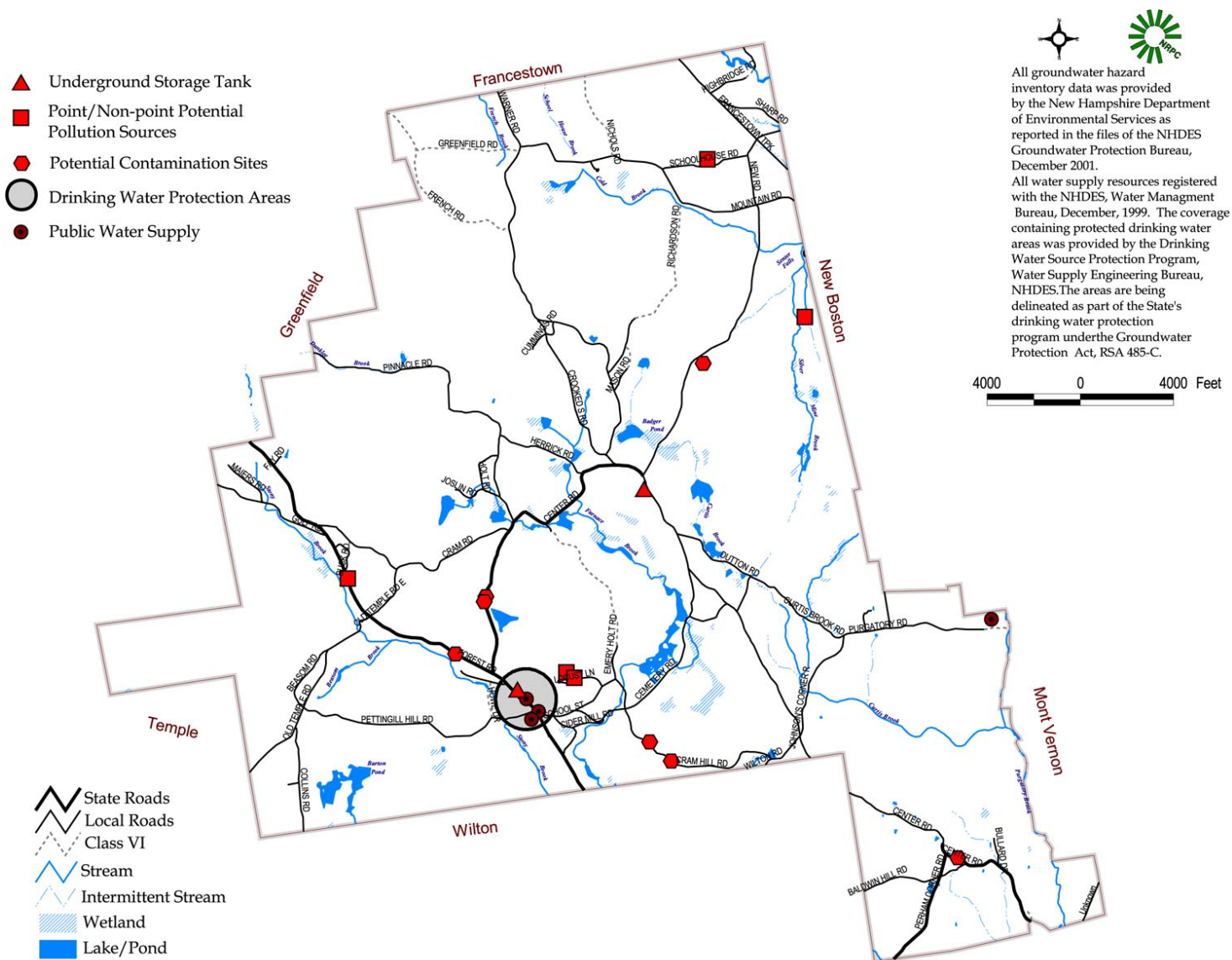
Underground Storage Tanks

Leaks in improperly equipped underground storage tanks, USTs, are difficult to detect and may go unnoticed for a long time. Even a small leak of only a few gallons can contaminate millions of gallons of ground water. The State regulates USTs where the cumulative volume of all tanks at the facility is 1,100 gallons or more. Some tanks, including those containing non-petroleum based chemicals and those containing heating oil for on-site residential consumption are exempted. As of 2001, two USTs in Lyndeborough were registered with the NH Department of Environmental Services, Water Supply and Pollution Control Division.

Waste Sites

Contaminants from waste disposal sites and sites contaminated by industrial activities can leach into surface and ground waters. The NHDES 1987 *Waste Site Inventory* identified the municipal landfill as the only waste site in Lyndeborough.

Map IV-5: Point and Non-Point Pollution Sources



Road Salt

Road salt storage and application create the potential for sodium, calcium, and chloride contamination of surface and ground waters. Elevated sodium and chloride levels in drinking water supplies can pose serious health threats for certain population groups as well as animals and plants. In addition, high levels of chloride in surface waters can inhibit water mixing, cause stratification and salination of the bottom layers. At the time the Master Plan was adopted, the Town stored salt in an uncovered facility located on Locust Lane and an enclosed salt bay is needed to meet EPA requirements. The Town does not have an established sand/salt mixture policy; however, the percentage does vary depending on the type of storm. A number of towns in the region have adopted reduced and/or no-salt programs in sensitive areas such as near public water supply wells, concentrations of individual wells and surface waters.

E. FORESTS

Forests were the dominant landscape characteristic after the retreat of the glaciers. Before 1623 and the colonization of New Hampshire, southern New Hampshire was 93% forested, with the 7% open space being marsh or ponds. Many major changes have affected the ecosystem in southern New Hampshire since that time. By 1850, at the height of agricultural development in New Hampshire, only 20% was forest, while the remaining 80% of Hillsborough County was cleared for livestock grazing, growing livestock feed, and other crops for home consumption. Most of the changes historically are associated with population and economic opportunities. Agriculture began to decline during the 1860's with the western migration and industrialization of the northeast. The Amoskeag Mills in Manchester (incorporated in 1831 and by 1910 was the largest textile mill in the world, employing 17,000 workers) and the mills in Lowell and Lawrence drew workers (particularly females) from rural communities to the cities. These fields slowly gave way to scrub trees. Conifers generally took over the abandoned farmlands and meadows.

During the 20th century, foreign disease and pests have changed forest composition and were responsible for the decline or destruction of the American Beech, American Elm, and the American Chestnut. The introduction of the chestnut blight from Asia around 1904 killed most of the mature chestnuts within 20 years. According to the 1997 Integrated Natural Resources Management Plan for the New Boston Air Station, remnants of stands of chestnut trees have been discovered on the installation. The proximity of "Chestnut Hill" also suggests that chestnuts were prevalent throughout the entire area.

According to the Society for the Protection of New Hampshire's document entitled "New Hampshire's Changing Lands", reforestation began to stabilize during the 1960's. The peak and downturn of forest cover began in the 1970's and 1980's when population gains and development increased throughout the state. Around 1983, New Hampshire reached an estimated high of 87% forest cover, which has not been seen since 1700. Satellite analyses indicate that the forest cover was approximately 83% in 1993 and 76% in 2001. This makes New Hampshire the second most forested state after Maine. The forest industry is the third largest in the state after tourism and manufacturing.

South central New Hampshire receives approximately 43 inches of precipitation per year. Most of this precipitation is evenly distributed throughout the year, though there can be occasional droughts in the summer. The area's climate is ideal for the growth of forest trees. Among the common tree species found in Lyndeborough's forests are White Pine, White Oak, Red Oak, American Beech, White Birch, Black Birch, Sugar Maple, Red Maple and Eastern Hemlock.

White pine has been the predominant tree harvested since colonial times. Hillsborough County is still a leader in white pine sawlog production. Red oak and sugar maple command a good market

price. Deciduous and mixed forest types are dominant in Lyndeborough, comprising approximately 87% of total land cover in Town.

Silviculture activities in Lyndeborough consist predominately of hardwood and pine harvesting and firewood sales. Firewood is still widely used as an additional heat source in the winter. Small woodlots continue to be selectively cut as supplemental income. The most current timber harvest was the former Lorden property, which harvested the most valuable timber on approximately 300 acres in the southeastern section of Town.

Performance standards and plan review for silvicultural activities are regulated by the State through timber harvesting and water quality laws. Regulation prohibits the placement of slash and mill waste in or near waterways, and limits clear-cutting near great ponds and streams. These requirements may mitigate to some degree water quality impacts associated with timber harvesting. There is no set policy on clearcutting in Lyndeborough, but the Conservation Commission continues to verbally negotiate buffer widths with loggers on a case by case basis.

A greater percentage of Lyndeborough (87%) is forested than any other town in the Nashua region. Nearly 73% of this area is found in blocks greater than 500 acres, which is critical for wildlife habitat and the preservation of biological diversity. Many species of birds and mammals require large, unbroken tracts of forest in order to sustain their populations. Preserving unfragmented forest blocks helps retain the Town's scenic beauty and provides wildlife corridors for larger mammals. See Map IV-6 for location of forest blocks greater than 10 contiguous acres in size.

Table IV-4 provides a summary of Lyndeborough's forest facts derived from the study, "New Hampshire's Changing Landscape", produced by the Society for the Protection of New Hampshire Forests in 1999. The forest and habitat data provided in that report is derived from 1992 - 1993 Landsat satellite imagery, the most recently available data source on forest resources on a regional level.

Table IV-4: Lyndeborough Forest Facts

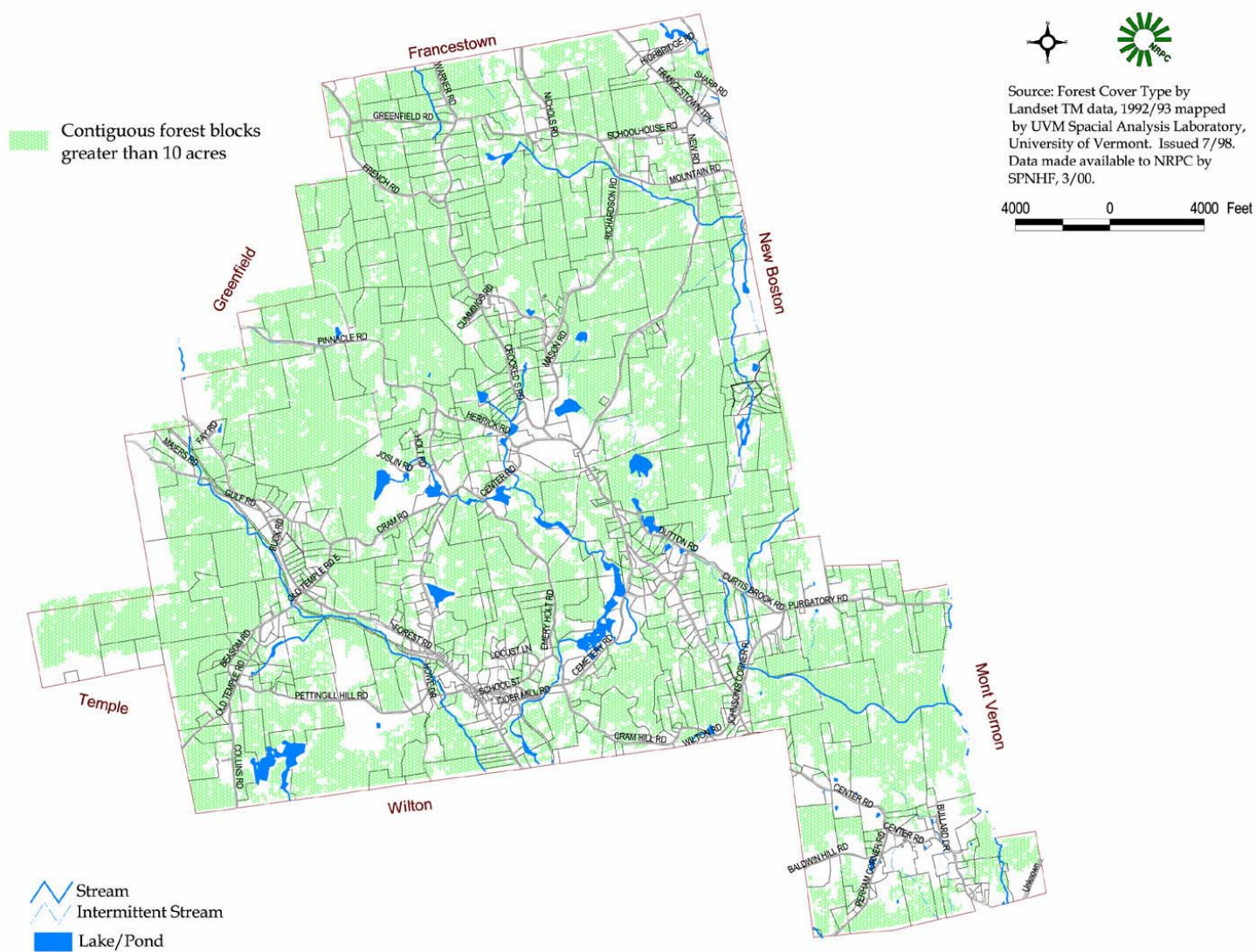
Total Area of Lyndeborough in Acres	19,297.49
Total area in Forest Blocks > 500 acres	12,274.39
Number of Forest Blocks > 500 acres	10
Average and Median Size of all Forest Blocks	322.3
Percentage of Forest Blocks > 10 acres that are protected	6.2%
Predicted Decline in Forest Area by 2020	861.6
Predicted % Decline in Forest Block Size by 2020	29.0%

Source: New Hampshire's Changing Landscape, Society for the Protection of New Hampshire Forests, 1999, based on 1992-1993 landsat data.

Forestland Evaluation and Site Assessment (FLESA) Process

The FLESA process is a planning tool to aid towns as they plan for future development and natural resource needs, with careful consideration for what currently and could potentially exist. The FLESA process has two basic components and is based on a point system.

Map IV-6: Forest Blocks Greater Than 10 Acres



The first is referred to as land evaluation. This is a technical evaluation of a parcel or site's ability to grow desirable species based on soil information. The land evaluation considers the productivity potential of the soil as well as the probability that the tree species growing on site will produce quality trees. The key tool is using GIS to identify where Important Forest Soil Groups (IA, IB, IC, IIA, IIB) and Forest Type Cover is located

The second phase is site assessment. Specifically, FLESA will help inventory forest based resources, and assess commercial timberland, wildlife habitat, recreation use, and scenic resources. Timber resource assessment would include examining accessibility to the site, environmental limitations, parcel size, and contiguous acreage. The ranking for wildlife would use the same criteria as timber resource but also includes known threatened and endangered species, unique or critical habitat, and different wildlife attractors such as streams, orchards, etc. Recreation resources would include accessibility, trail type present, remoteness, and recreational activity present. Scenic resources consider the type of view, topographic features, special or unusual features, and vegetation.

F. WILDLIFE AND PLANTS

Lyndeborough's natural resource base provides a habitat for many plant and animal species. A variety of habitats such as wetlands, forests, fields, rivers, and streams are essential to support a diversity of species in quantities healthy enough to ensure continuation of the species. Maintaining quality habitats is crucial to the continuation of all plant and animal species.

The New Hampshire Natural Heritage Inventory (NHI), a program of the Department of Resources and Economic Development, tracks threatened and endangered species and exemplary natural communities in the State. Using a ranking system developed by the Nature Conservancy, the NHI assesses the rarity of a species on a global and state level. State listing ranks are defined by New Hampshire Code of Administrative Rules (RSA 217-A:3). The NHI records identify one "historical" Southern New England Dry Rich Forest on Acidic/Circumneutral Bedrock or Till natural community in Lyndeborough. Natural communities are basically different types of forests, wetlands, grasslands, etc. The NHI formally defined as assemblages of plants and animals that recur in predictable patterns across the landscape under similar physical conditions.

However, the 1997 Argonne National Lab (ANL) Biodiversity Survey identified 9 natural communities on the New Boston Air Station (NBAS), which has similar terrain and elevation. These areas, identified by the dominant plants, vegetative structure and minor features of the physical environment, represent intact examples of New Hampshire's native flora and fauna.

1. Animals

Animal species commonly found in Lyndeborough include: raccoons, opossums, skunks, muskrats, beavers, porcupines, woodchucks, white-tailed deer, squirrels, mice, bats, foxes, rabbits, and other indigenous species that are adapted to living near humans and urban activities. Sightings of coyote, otter, black bear, and fishers have increased in Lyndeborough as they have in other municipalities. Moose have also been sighted in recent years. Larger animals that require extensive habitat areas or species that require solitude such as black bears are occasionally sighted in the Town. It is recommended that the Conservation Commission and interested citizens participate in the "Keeping Track" Program. This program uses animal tracks to identify habitats and feeding grounds in a systematic manner for a variety of animals. The information gained can be the start of an inventory and a monitoring system of prime habitats for future conservation.

2. Birds

Bird species vary according to the season: however, they are also dominated by those species commonly found in southern New Hampshire. Doves, woodpeckers, chickadees, and jays are found throughout the year while warblers, sparrows, hummingbirds, wrens, swallows, robins, and several species of raptors are generally seasonal residents. In addition there are owls, wild turkeys, woodcocks, ruffed grouse, blue herons, pileated woodpeckers, cardinals, bluebirds, and red-tail hawks. Other species such as ducks and geese may nest in the wetlands and ponds and many pass through the Town during spring and fall migrations. The only species found that is listed in the NH Heritage Inventory as endangered is the Pied-Billed Grebe.

The “Watch List” is a program developed by the National Audubon Society to call attention to birds at risk before they require federal listing, stressing preventative action today over last ditch rescue attempts in the future. Many agency scientists (USFWS, DOD, Audubon) are involved in the Partners in Flight Program. The Partners in Flight Program is a similar program to the Watch List but on an international scale. The Audubon Watch List annually targets bird species with declining populations; species with limited ranges; and species facing threats such as habitat loss on their breeding grounds, wintering grounds, and migratory routes. The Watch List species listed in Table IV-5 were identified during the biodiversity study at New Boston Air Station. Since many of the same habitats can be found throughout the region, it is likely that the same species can be found in Lyndeborough.

Table IV-5: National Audubon Society’s Watch List

American Bittern	Grey Catbird
Black-billed Cuckoo	Field Sparrow
Yellow-billed Cuckoo	Prairie Warbler
Chimney Swift	Palm Warbler
Eastern Pewee	Bobolink
Veery	Wood Thrush

Source: Argonne National Lab 1997 Biodiversity survey
of New Boston Air Station; Audubon Society’s Watch List.

3. Vernal Pools

In addition to the highly visible species, habitats for other less visible species such as turtles, frogs, toads, salamanders, snakes and numerous insects are present in the Town. Vernal pools are essential for the life cycle of many invertebrates and amphibians. These temporary forested wetlands serve as a home to many of these species, which feed off the nutrients from fallen leaves.

Most vernal pool animals do not live their entire lives in the pool but migrate in response to seasonal ponding and drying. Mole salamanders and wood frogs spend 90% of their lives in the surrounding uplands, perhaps as far as a quarter mile from the pool. Adults migrate to the pool for a few weeks to reproduce and surviving juveniles leave before the water dries.

Other organisms (e.g., snakes, turtles, insects, and birds) migrate from nearby wetlands to breed or feed in the productive pool waters. These animals return to more permanent wetlands. Other animals develop entirely in the pool and most survive the dry season. Fingernail clams and air-breathing snails burrow beneath the leaves that remain to await the return of water. Fairy shrimp deposit eggs in the dry pool that hatch after the pool refills.

4. Plants

Plants commonly found in southern New Hampshire dominate the species in Lyndeborough. The NHI records indicate there are no threatened or endangered plant species in Town. However, the New Hampshire Native Plant Protection Act identifies 11 plants as “special concern.” These species are not rare in New Hampshire, but their showy nature makes them vulnerable to over collection. Table IV-6 identifies the species of special concern, many of which are found in Lyndeborough.

Table IV-6: Plant Species of Special Concern

Grass Pink	White Fringe Orchids
Flowering Dogwood	Large Purple Fringed Orchid
Pink Lady’s Slipper	Rose Pogonia
Dutchman’s Breeches	Lapland Rosebay
Trailing Arbutus	Pitcher Plant
Mountain Laurel	

Source: NHI.

A comprehensive biodiversity survey has never been performed for Lyndeborough, however, the New Boston Air Station (NBAS) survey is the closest intensive survey that has been completed in the region. A total of 454 species of plants were identified in the 1997 Argonne National Lab (ANL) biodiversity survey conducted over a three year period. No federally listed threatened or endangered plants were found on the station. However, the fern-leafed false foxglove is listed by the State of New Hampshire as endangered.

5. Native Fauna

A total of 147 species of birds have been recorded at NBAS during the ANL biodiversity survey; 109 were neo-tropical migrants. The only federally listed (threatened) species was the bald eagle. The eagle was spotted during the fall migration and is known not to use the habitat on the base. Several state listed species were observed and included: pied-billed grebe (endangered), osprey (threatened), Cooper’s hawk (threatened), and northern harrier (threatened). The harrier was observed during fall migration.

G. EXISTING CONSERVATION AND PUBLICLY OWNED OPEN SPACE AREAS

The Town of Lyndeborough contains a variety of conservation and recreation lands under both public and private ownership. These areas account for over 726 acres of the total land area in Lyndeborough. Once a popular resort area, Purgatory Falls is now only accessible by hiking. Purgatory Brook flows through heavily wooded, pristine forest. The water surges through a deep flume before cascading into the pool below. Ted Bonner from Greenfield and volunteers have created a trail along most of the brook.

The Town has acquired a number of conservation easements over significant properties and adjacent to sensitive areas such as wetlands. These easements protect important natural and community areas while providing interconnections between the larger public parcels. In addition to the conservation lands under the more permanent forms of protection, approximately 14,507 acres or 75% of the Town’s land area were enrolled in the current use assessment program in 2001.² The New Hampshire legislature has recognized the importance of open space and has found that its preservation is in the public interest:

² Source: NRPC GIS. Acres based on area of GIS parcels coded as current use, 2002.

It is hereby declared to be in the public interest to encourage the preservation of open space, thus providing a healthful and attractive outdoor environment for work and recreation of the State's citizens, maintaining the character of the State's landscape, and conserving the land, water, forest, agricultural and wildlife resources. It is further declared to be in the public interest to prevent the loss of open space due to property taxation at values incompatible with open space usage. Open space land imposes few if any costs on local government and is therefore an economic benefit to its citizens. (RSA 79-A:1)

The current use program provides reduced property assessments for forests, farmland, and wetlands of ten acres or greater and for active farms with a minimum \$2,500 gross value of product on properties less than ten acres. The current use program provides limited short-term protection because enrolled, open land can easily be converted to other uses. Land in current use remains so until the land no longer meets the current use criteria. Land coming out of current use is subject to a land use change tax of 10% of the fair market value at the time of the change.

Map IV-7 illustrates the location of the significant conservation properties in Lyndeborough. The preservation and conservation of these sites and areas is of tremendous importance to the preservation of the visual quality, water quality, farms and forests, wildlife habitats, greenways, trails and rural character of the Town.

H. VISUAL RESOURCES



The visual resources of a community are a major component of its image and sense of place, and have an impact on the quality of life for residents and the perceptions of visitors. The Town of Lyndeborough is well aware of the value of its natural resources: ponds, streams, wetlands, and forests, its orchards and active agricultural lands, and its built environment – the Town center, historic homes, mills, and stone bridges. Center Road and NH Route 31 in particular have outstanding views that should be protected.

Reasonable protection of outstanding views and vistas has withstood the test of the courts on numerous occasions throughout the country. Typical view protection regulations involve height limitations for buildings, chimneys, antennas and/or setbacks. Height limitations have been used to preserve views of natural features such as mountain peaks, park areas and river views, and for protecting the stature of historic structures and landmarks. Special design criteria can also be used to minimize the visual impact of hillside/ridgeline development. Building materials such as rock, stone, brick and wood are compatible with the environment and tend to blend in better than other materials. The use of earth tone colors for paint or stain help to soften the building. Design that minimizes the disturbance or existing natural landforms and retention of existing vegetation should also be taken into consideration.³

I. PRIORITIES FOR FUTURE CONSERVATION EFFORTS

As part of a state-wide effort with funding provided by the New Hampshire Department of Environmental Resources (DES), the Nashua Regional Planning Commission has been working with member communities, regional and state organizations to identify the natural and cultural resource protection needs and priorities for the region.

³ See: Thomas Kokx Associates, Best Management Practices for Hillside/Ridgeline Development, Town of Meredith, NH, February 2001.

The Regional Environmental Planning Program (REPP) has been a response to these statewide conservation efforts. During Phase One of the program representatives of each of NRPC's member communities were provided a series of maps containing region-wide natural/cultural resource information, a base map of their own community, instructions, and a summary of municipal conservation goals. Information collected from communities has been digitized and compiled into a first phase report that includes a map showing the location and type of resource. During Phase Two, the communities were asked to further prioritize the resources identified in the first phase. Phase Two asks each community to identify their top five natural and cultural resource priorities. Lyndeborough identified the Temple Road Bridge as the top cultural/historic top priority but, at the time the Master Plan was adopted, had not yet selected any natural resources priorities.

The results of the Community Profile indicates that preservation of orchards, ground water supply, wetlands, forests, conservation land, trails, wildlife habitat and scenic roads are a high priority. The results also show that residents recommend that a complete Natural Resources Inventory (NRI) be completed. An NRI lists and describes important naturally occurring resources within a given locality. At its simplest, an NRI is the compilation and description of existing natural resources data. At its most complex, it includes detailed analysis of specific natural resources. An NRI could be useful in identifying natural resource priorities for Lyndeborough.

The Land and Community Heritage Commission (LCHC) was established under Senate Bill 493 in 1999 "to determine the feasibility of a new public-private partnership to conserve New Hampshire's priority natural, cultural and historic resources." In 2000, Senate Bill 401 was presented in order to provide the LCHC with \$3 million to begin a matching grant program for local land conservation efforts.

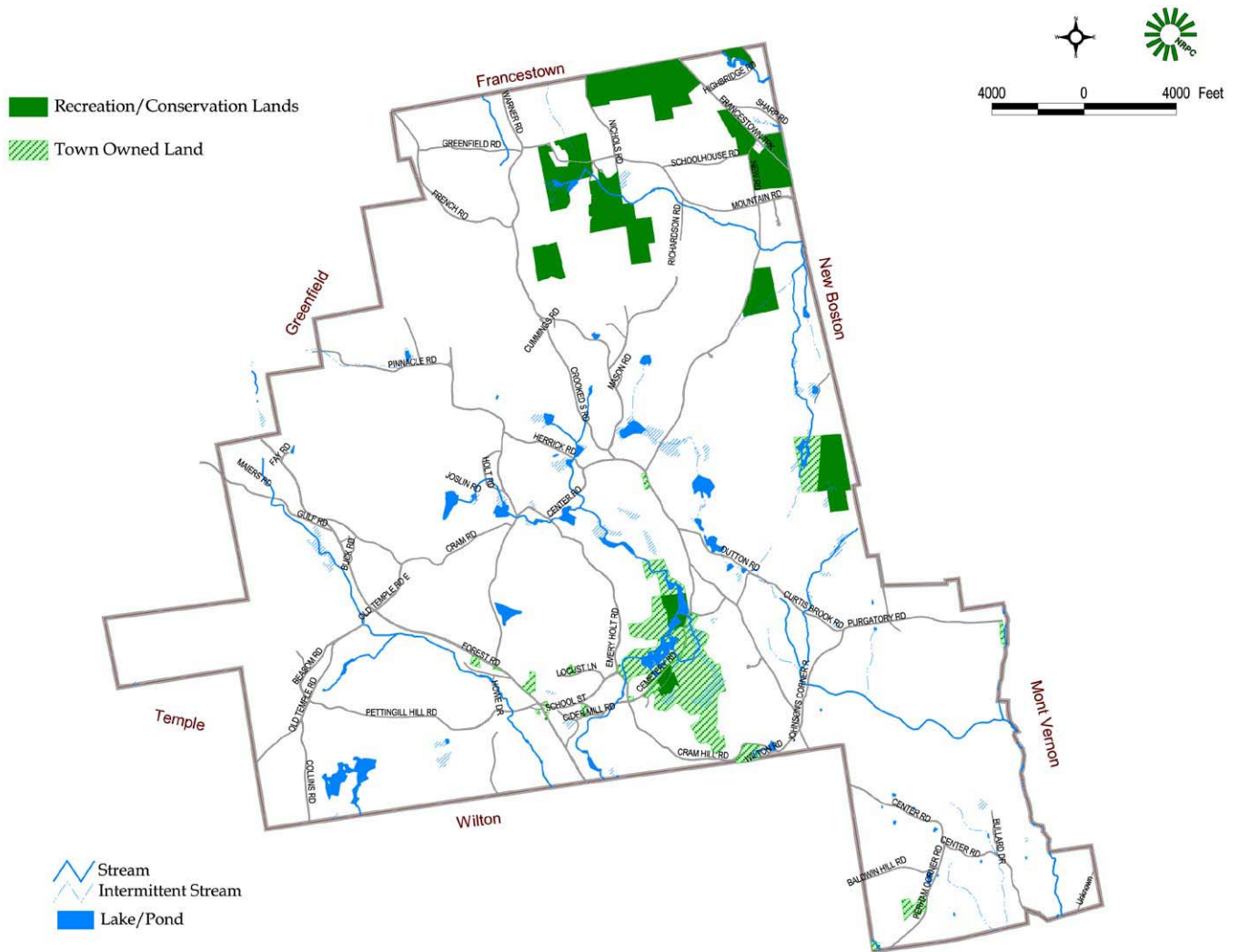
A program called the Land and Community Heritage Investment Program (LCHIP) will carry out the goals of Senate Bill 401 and the LCHC. The New Hampshire General Court created LCHIP in order to:

"...conserve and preserve this State's most important natural, cultural, and historical resources through the acquisition of lands, and cultural and historical resources, or interests therein, of local, regional, and statewide significance, in partnership with the State's municipalities and the private sector, for the primary purposes of protecting and ensuring the perpetual contribution of these resources to the State's economy, environment, and overall quality of life."

LCHIP was designed to achieve this mandate by providing grants to eligible applicants. Applicants must provide at least a 50% match (at least half of which must be in cash) to be eligible for funding through the program. The next grant round for LCHIP funds will take place in the spring of 2002. Communities will use the conservation priorities established through the REPP process to propose parcels and projects for grant funding through LCHIP. The bill, as introduced, dedicated full funding of LCHIP at the \$12 million level. The House Resources, Recreation, and Development Committee voted to amend the bill to \$4 million for LCHIP in 2002. The amended bill does not include the real estate transfer tax as the dedicated funding source, but relies on the state's general fund after 2002.

The 2001 Community Profile revealed that preservation of orchards, ground water supply, wetlands, forests, conservation land, trails, wildlife habitat, and scenic roads were a high priority. However, to date, no specific parcels have been identified. A Natural Resource Inventory could assist in this endeavor.

Map IV-7: Existing Conservation Lands



J. RECOMMENDATIONS

1. Topography

- Continue to protect steep slopes and high elevations from inappropriate development through the soil and elevation based Zoning.
- Consider developing special design criteria to minimize the visual impact of hillside development including the use of building materials compatible with the environment (rock, stone, brick and wood) and to preserve existing vegetation and natural land forms.

2. Soils

- When reviewing the intensity of development, the Planning Board should continue to consider soil potentials, limitations and slopes. Soils with steep slopes and/or low potential for supporting septic tank absorption fields should be limited to open space.
- The Town's few remaining agricultural lands are recognized as an important and endangered resource with few State or local incentives for keeping viable agricultural lands in production. To protect this valuable resource, the Town should take steps to protect active and idle agricultural lands from development for other uses and create incentives, which encourage agricultural lands to be kept in, or returned to productive farm use. The Land and Community Heritage Investment Program, the American Farmland Trust, the Wapak Land Trust and the Farmland Protection Program may assist the Town in this endeavor.
- Continue to require the use of Site Specific Soil Mapping Standards (SSSMS) in the subdivision regulations and consider amending the site plan regulations to require the use of SSSMS. The SSSMS are the most current standards available that can be used for a variety of land use activities.

3. Water Resources

- Consider researching the creation of a municipal waste water treatment system in South Lyndeborough since there is a heavy concentration of community and residential wells in this area.
- Protect existing wetlands and surface waters by amending the Wetlands Ordinance to include an adequate buffer from the edge of the wetland or surface water. A minimum of 100 feet is suggested for all surface waters. This buffer will protect the natural habitat surrounding wetlands and surface waters that is crucial to the proper functioning of these water resources.
- Consider increasing the setbacks from wells located in glacial till soils. These wells are close to the surface and are very susceptible to contamination.
- Undertake a Prime Wetland Inventory to give these wetlands additional consideration by the Wetlands Bureau when development proposals are presented to the Town.
- Require herbicide, pesticide and arsenic testing in all new wells in former orchards in the southeast part of Town since the orchards overlay till or stratified drift aquifers and are highly susceptible to contamination.

4. Forests, Wildlife and Plants

- Consider using the Forestland Evaluation and Site Assessment (FLESA) for future forest planning and components of the FLESA Program on all Town owned lands.

- Maintain a 50 foot undisturbed, shady buffer around vernal pools and a 100 foot buffer from property lines abutting forests and all surface waters.
- Consider legal easements on all Town Forests to preserve the land for recreation and permanent protection.
- Inventory all existing trails using Geographic Positioning System (GPS) and create a trail system map signage for all Town forests.
- Consider a long-term insect monitoring plan for Hemlock Woolly Adelgid, weevils, and others.
- Take advantage of the University of New Hampshire's Community Environmental Outreach Program (CEOP) and Natural Resources Senior Projects for a plant biodiversity survey. These are inexpensive programs and the range of possible projects is limited only by the needs of the community and the availability of students to match those needs.

5. Conservation

- Conduct a Natural Resources Inventory of Lyndeborough to assist with future conservation efforts.
- The unique local and regional resource of Lyndeborough's high elevations should be preserved and encouraged to be made accessible to the public through donated recreational easements. The Town should actively seek conservation easements for such land.
- Pursue the fee purchase, purchase of development rights, or other conservation measures to protect significant properties identified by the Conservation Commission or in a Natural Resources Inventory.
- Consider raising the Land Change Use Tax to help contribute towards increasing the number of protected open space parcels and provide matching funds for potential LCHIP applications.
- The Conservation Commission and interested citizens should consider participating in the "Keeping Track" program. This program uses animal tracks to identify habitats and feeding grounds in a systematic manner for a variety of animals. The information gained can be the start of an inventory and a monitoring system of prime habitats for future conservation.
- Take advantage of the University of New Hampshire's Community Environmental Outreach Program (CEOP) and Natural Resources Senior Projects. These are inexpensive programs and the range of possible projects is limited only by the needs of the community and the availability of students to match those needs.

APPENDIX VI-A

Sources

- Argonne National Lab, *The Integrated Natural Resources management Plan for the New Boston Air Station*, 1997.
- Comprehensive Environmental Inc., *Phase II Stormwater Rule Summary and How Municipalities Can Prepare for Compliance*, 2000.
- Department of Agriculture, Soil Conservation Service, *Soil Survey of Hillsborough County New Hampshire, Western Part, United States*, October 1981.
- Nashua Regional Planning Commission (NRPC), *Intermunicipal Aquifer Study*, 1990.
- New Hampshire Department of Environmental Services, *Best Management Practices to Control Nonpoint Source Pollution*, 1997.
- NH DES, *New Hampshire Nonpoint Source Management Plan*, 1999.
- NH DES, Water Division, *Survey Lake Data Summary*, November 2000.
- NH Department of Recreation and Economic Development and the Society for the Protection of New Hampshire Forests, *Good Forestry for the Granite State: Recommended Voluntary Forest Management Practices for New Hampshire*, 1997.
- New Hampshire Fish and Game, *Identification and Documentation of Vernal Pools in New Hampshire*, 1997.
- North Country and Southern New Hampshire Resource Conservation and Development Area Councils, *Planning for the Future of Local Forests*, 2001.
- Society for the Protection of New Hampshire Forests, *New Hampshire's Changing Landscape*, 1999.
- UNH Cooperative Extension, *Natural Resources: An Inventory Guide for NH Communities*, 2000.
- United States Geological Survey, *Hydrogeology of Stratified-Drift Aquifers and Water Quality in the Nashua Regional Planning Commission Area, South-Central New Hampshire, Water Resources Investigations Report 86-4358*, 1987.

This chapter of the Lyndeborough Master Plan update is intended to supplement, and not replace, the findings and recommendations of any earlier studies.

APPENDIX VI-B

Important Agricultural Soils in Lyndeborough

Prime Farmlands

Symbol	Soil Name and Slope	
AgA	Agawam fine sandy loam	0-3%
AgB	Agawam fine sandy loam	3-8%
BaA	Belgrade silt loam	0-3%
HsD	Hinckley loamy sand	15-35%
NnB	Ninigret very fine sandy loam	3-8%
Oc	Occum fine sandy loam	
Om	Occum fine sandy loam	high bottom
PbB	Paxton fine sandy loam	3-8%
Pu	Pootatuck fine sandy loam	
WoB	Woodbridge loam	3-8%

Statewide Importance

Symbol	Soil Name and Slope	
CaB	Canton fine sandy loam	0-8%
CaC	Canton fine sandy loam	8-15%
PbC	Paxton fine sandy loam	8-15%
PhB	Pennichuck channery fine sandy loam	3-8%
PhC	Pennichuck channery fine sandy loam	8-15%
SsA	Scituate fine sandy loam	0-3%
SsB	Scituate fine sandy loam	3-8%

Source: Soil Survey of Hillsborough County, New Hampshire, Western Part,
US Department of Agriculture, Soil Conservation Service, 1980.

Soil Limitations for Septic Systems

Slight Limitations to Septic Systems

Symbol	Soil Name and Slope	
CaB	Canton fine sandy loam	0-8%

Moderate Limitations to Septic Systems

Symbol	Soil Name and Slope	
CaC	Canton fine sandy loam	8-15%
CmB	Canton stony fine sandy loam	3-8%
CmC	Canton stony fine sandy loam	8-15%

Severe Limitations to Septic Systems

Symbol	Soil Name and Slope	
AgA	Agawam fine sandy loam	0-3%
AgB	Agawam fine sandy loam	3-8%
BaA	Belgrade silt loam	0-3%
BaB	Belgrade silt loam	3-8%
CaD	Canton fine sandy loam	15-25%
CmD	Canton stony fine sandy loam	15-25%
CmE	Canton stony fine sandy loam	25-35%
CnC	Canton very stony fine sandy loam	8-15%
CnD	Canton very stony fine sandy loam	15-35%
CpB	Chatfield-Hollis-Canton complex	3-8%
CpC	Chatfield-Hollis-Canton complex	8-15%
CsB	Chatfield-Hollis complex	3-8%
CsC	Chatfield-Hollis complex	8-15%
CtD	Chatfield-Hollis-Rock outcrop complex	15-35%
DeA	Deerfield loamy fine sand	0-3%
DeB	Deerfield loamy fine sand	3-8%
Has	Hinckley loamy sand	0-3%
HsB	Hinckley loamy sand	3-8%
HsC	Hinckley loamy sand	8-15%
HsD	Hinckley loamy sand	15-35%
MoB	Montauk fine sandy loam	3-8%
NnA	Ninigret very fine sandy loam	0-3%
PbB	Paxton fine sandy loam	3-8%
PbC	Paxton fine sandy loam	8-15%
PfB	Paxton stony fine sandy loam	3-8%
PfC	Paxton stony fine sandy loam	8-15%
PfD	Paxton stony fine sandy loam	15-25%
PhB	Pennichuck channery fine sandy loam	3-8%
PhC	Pennichuck channery fine sandy loam	8-15%
PHd	Pennichuck channery fine sandy loam	15-25%
SsA	Scituate fine sandy loam	0-3%
SsB	Scituate fine sandy loam	3-8%
StA	Scituate stony fine sandy loam	0-3%
StB	Scituate stony fine sandy loam	3-8%
StC	Scituate stony fine sandy loam	8-15%
WdA	Windsor loamy sand	0-3%
WdB	Windsor loamy sand	3-8%
WdC	Windsor loamy sand	8-15%
WdD	Windsor loamy sand	15-35%
WoB	Woodbridge loam	3-8%
WvD	Woodbridge stony loam	3-8%

Source: Soil Survey of Hillsborough County, New Hampshire, Western Part, USDA, SCS, 1980.

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